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Proc. Zool. Soc. Lond. (B), Vol. 81, Part 1.

ERRATA.

Paper by F. Brough.

Page 3, line 4 from the bottom (Heading). For "Hero-
pium" read "Micropeltinium."

Page 8, line 17 from the bottom. For "Metopini" read
"Mitopeltinini."

REMARKS ON THE CLASSIFICATION OF THE ETHIOPIAN SARCOPHAGINAE WITH DESCRIPTIONS OF NEW GENERA AND SPECIES.

By F. Zumpt, Ph.D., F.R.E.S.

(The South African Institute for Medical Research, Johannesburg.)

1. The Tribal Classification of the Sarcophaginae.

The classification of the Sarcophaginae has been a matter of discussion for a long time. I do not want to give an historical sketch of all proposals mainly based on chaetotaxy that have been put forward, but recent experiences have shown that the arrangement of bristles and hairs is very often not as constant as was formerly thought and, furthermore, has not the predominating value in determining the phylogeny of many groups in the Diptera. Patton in his numerous papers on the terminalia of the Higher Diptera has drawn attention to this fact several times. He expressed the opinion that the structure of the abdomen and especially of the postabdomen or the terminalia is more important and has a greater phylogenetic value. The same opinion is held by Rohdendorf (1937), who proposes a supergeneric division of the Sarcophaginae with which I quite agree in general outlines. However, I do not believe that it is advisable to split up the Calliphoridae *s. lat.* too much, and I am of the opinion that the Sarcophagidae *sensu* Rohdendorf and other authors should only be given the rank of a subfamily and his subfamilies should be regarded, consequently, as tribes. Furthermore, many of his new genera of *Sarcophaga s. lat.* are only subgenera and it is better to retain *Sarcophaga* as a big genus, as has been done, for example, by Senior White, Aubertin and Smart (1940), and not to split it up indefinitely like Townsend (1938) or Enderlein (1928). This problem is to be discussed in a coming paper.

The following classification of the Ethiopian tribes of Sarcophaginae is based on Rohdendorf's work, with the exception that I include his *Macronychiini* in the *Miltogrammini* and his *Chrysogrammatini* in the *Sarcophagini*:

1 (2) Postabdomen of male consists of 4 free segments, namely the 6th, 7th, 8th and the 10th (epandrium) with the cerci. Arista with long and thin hairs. Head rounded in profile, frons or epistome not angled. Frons narrow in the male, broad in the female. (Not yet known from the Ethiopian Region) . . . . . Mimodexiini

2 (1) Postabdomen of male consists of at most 3 free segments, the 7th, and 8th being fused. Frons or epistome more or less protruding. 3

3 (4) Postabdomen of male consists of 3 free segments, the 6th not fused with the united 7th and 8th segments. Arista bare, or with short pilosity. Frons usually with a distinct angle in the profile, if not, epistome protruding. Frons in both sexes of about the same width . . . . . Miltogrammini

4 (3) Postabdomen of male consists of 2 free segments (1st and 2nd genital segments), the 6th segment being separated from the 7th + 8th by a suture or being partly or wholly reduced 5

5 (6) First genital segment large, being fused with a well-developed 6th tergite, which is separated from the 7th + 8th tergite by a suture or a row of strong bristles. Arista mostly with long hairs, rarely with short ones only. Frons of male, as a rule, broader than in the female . . . . . Agriini

6 (5) First genital segment without an indicated 6th tergite, no suture or row of boundary bristles; it is totally fused with the following segments or usually totally reduced. Arista, as a rule, with long hairs, rarely short pilose or bare . . . . . Sarcophagini

The Mimodexiini undoubtedly represent a primitive group of the SARCOPHAGINAE. All tergites of the male postabdomen are still free; the spiracles VI and VII lie in the tergites. The 5th sternite is large, longer than broad, and shows only a shallow posterior emargination. Also the cerci-like paralobi must be regarded as primitive in the SARCOPHAGINAE, having a similar shape as in the genus *Calliphora*. The same is true for the phallosome, which could belong to a member of the genus *Calliphora*. Mimodexiini have not yet been recorded from the Ethiopian Region and there are, as far as I am aware, only a few species of the genus *Mimodexia* Rohdendorf (1935) known from Asia.

The Miltogrammini are more advanced, having the 7th and 8th tergites fused in the male postabdomen; the spiracle VI lies in the tergite and VII in the intersegmental membrane, or both spiracles are found in the latter. The 5th sternite is intermediate between the Mimodexiini and the higher developed Sarcophagini, having a more or less deep posterior emargination which may be provided with some bristly hairs. The paralobi and phallosome are still of primitive structure and similar to those of the Mimodexiini. The Miltogrammini are well represented in the Ethiopian Region, but most of the species are probably still to be discovered.

The Agriini are, in general appearance, similar to the Sarcophagini, and the male postabdomen, as in that tribe, consists of two free segments only, but the first still shows clearly a 6th tergite which is separated from the united 7th and 8th by a suture or a row of bristles. The spiracles VI and VII lie in the tergites. The 5th sternite is constructed as in the Miltogrammini. The paralobi are more or less triangular and are, therefore, similar to those of the Sarcophagini. The phallosome is not as complicated in structure as in the Sarcophagini and rather primitive in general appearance, but heavily sclerotized. To this tribe belongs the genus *Wohlfahrtia*; I have not yet seen other Ethiopian genera.

The Sarcophagini are the most highly developed tribe which shows a further reduction of the 6th tergite and a tendency for the phallosome to become complicated. The 5th sternite is deeply emarginated and, as a rule, provided with dense rows of stout hairs or spines forming a comb-like structure. It is doubtful if a sharp line can always be drawn between the Agriini and Sarcophagini. An intermediate genus, for example, is the new genus *Xiphidiella* described below, the first genital segment of which places it without question in the Sarcophagini, but the spotted abdomen, the bare hind coxa and the short pilose arista are reminiscent of the genus *Wohlfahrtia*. The most important genus of this group is *Sarcophaga* Meigen (*s. lat.*), a genus with a world-wide distribution and many species in the Ethiopian Region.

II. NEW GENERA AND SPECIES OF THE METOPIINI.

The following genera occur in the Ethiopian Region as far as I know:

1 (10) Mid-tibia with 2 or 3 antero-dorsal median bristles 2
2 (7) Eyes hairy in both sexes 3

3 (4) Head profile subtriangular and irregularly semicircular, frontal profile rather arcuate and over half as long as facial, latter much shortened . . . . . *Sankisius* Villen.

4 (3) Head profile of normal shape, frontal profile being about as long as facial 5

5 (6) Vibrissa wanting; row of parafrontals irregular, partly doubled, parafrontalia and parafacialia with long dense hairs **Termitometopia** gen. n

6 (5) Vibrissa present; one regular row of parafrontals, parafrontalia and parafacialia densely haired or short pilose beside the normal orbital bristles . . . . . *Hoplacephala* Macq.

7 (2) Eyes bare in both sexes 8

8 (9) Vibrissa wanting; arista short and thick, not reaching beyond the vibrissal angle . . . . . *Capnopteron* Rohd.

9 (8) Vibrissa present; arista long and thin, reaching beyond the vibrissa . . . . . *gen. n.*

(Up to date, only a few females known to me.)

10 (1) Mid-tibia with 1 antero-dorsal submedian bristle 11

11 (12) First posterior cell (R_5) closed at the tip. Last section of the fifth longitudinal vein longer than the preceding section. Parafacialia setose . . . . . *Taxigramma* Ferris

12 (11) First posterior cell (R_5) open. Last section of the fifth longitudinal vein shorter than the preceding section. Parafacialia bare or setose 13

13 (14) Facial ridge with bristles reaching or surpassing the middle. Third antennal segment about six times as long as the second; arista short and thick, not reaching the vibrissa . . . *Craticulina* Bezzi

14 (13) Facial ridge with a few bristles only near the vibrissa which do not reach the middle of the ridge. Third antennal segment much shorter 15

15 (16) Arista in the male sex leaf-like (female not known) **Paraphylloteles** gen. n.

16 (15) Arista of normal shape 17

17 (18) Arista short, not reaching beyond the vibrissa, thickened on the basal half or more . . . . . *Setulia* Rob.-Desv.

18 (17) Arista long, reaching beyond the vibrissa, thickened on distinctly less than the basal half 19

19 (20) Parafrontalia with two complete rows of parafrontals, the outer row weaker than the inner one . . . . . *Pachyophthalmus* B.B.

20 (19) Parafrontalia with one row of parafrontals or only a few of these bristles are irregularly doubled 21

21 (22) Fronto-orbitals present; parafrontalia beset with short setae or nearly bare. Eyes hairy or bare . . . . . *Senotainia* Macq.

22 (21) Fronto-orbitals wanting; parafrontalia beset with long black hairs. Eyes bare . . . . . **Senotainiella** gen. n.

Sankisius Villeneuve.

The genus *Sankisius* based on *S. excisus* Villeneuve (1913) from the Belgian Congo is not known to me and was keyed out according to Townsend (1935). It is, perhaps, as suggested by Curran (1928), congeneric with *Hoplacephala* Macquart.

Termitometopia gen. n.[1]

Closely related to *Hoplacephala s. lat.*, from which it is chiefly separable by the lack of a vibrissa. Frons angled in profile, parafrontalia with irregular, partly doubled parafrontals, 5–6 fronto-orbitals, parafrontalia densely beset with long erect hairs; arista long, bare, basal half thickened. Eyes haired in both sexes. Wing-cell R_5 open, m with right angle. Mid-tibia with 2 antero-dorsal median bristles. Postabdomen with a free 6th tergite, spiracles VI and VII in the membrane; hypopygium with the paralobi cerci-shaped, phallosome simple, without appendages. Type species: *Termitometopia skaifei* sp. n.

Termitometopia skaifei sp. n.

In general appearance this species is somewhat similar to *Hoplacephala maculosa* Villeneuve.

Male.—Frons at the narrowest part on the vertex more than half as wide (3 : 5) as the longest eye diameter, strongly widened to the face. Colour of the head black, parafrontalia and parafacialia whitish dusted, the other parts yellowish-grey dusted. Chaetotaxy: iv and ev present, 2 pvt each, 1 divaricate pair of oc, 2 reclinate f, 5–6 proclinate fo; row of paf irregular, partly doubled, reaching base of the second antennal segments; vibrissa wanting, but the whole face as well as the parafrontalia densely beset with long and erect black hairs. Buccae less than half as broad as the eye is long (2 : 5). Eyes oval (3 : 5), facets small, of the same size throughout, distinctly haired. Third antennal segment very short, about as long as the second; arista relatively long reaching the margin of the epistome; bare, nearly basal half thickened. Vibrissa wanting, but peristome and facial ridge half-way upwards beset with long stiff hairs. Palpi short, dark brown, of equal width, on the ventral side beset with long and thin hairs; proboscis with well-developed labella.

Thorax black with greyish dust forming an indistinct pattern of two inner narrow lines and a broader one on each side. Chaetotaxy: mesonotum densely beset with long black hairs among which the usual bristles are not always distinct. Recognizable are only the pre-scutellar ac, dc = 2 + 4, ia = 1 + 2, h = 2, ph = 2, prs = 1, n = 3, sa = 3; scutellum with 5 pairs of marginal bristles, but no discal ones (sc = 5 + 0). Prostigma black, st = 1 : 1, but sternopleura densely beset with long hairs as on the other parts of the thorax. Prosternum and propleura bare.

Wings smoky, veins brown, R_5 narrowly open, m with a right angle and a continuation beyond it; costal spine not developed; veins on the upperside bare except r_{4+5}, which bears a few, relatively long setae from the root halfway to cross-vein, on the ventral side with 2 hairs on the root of r_3 and r_{4+5}; calypter broad, triangular, truncate, bare on upperside, light yellow with a narrow darker yellow margin. Halteres yellow, with a red-brown knob.

Legs black; front femur with a ventral row of long bristles, front tibia with 2 postero-dorsal and 2 postero-ventral median bristles; mid-femur with a few long bristles on the ventral side, mid-tibia with 2 antero-dorsal and 3 postero-dorsal and 3 posterior median bristles; 1 big ventral submedian bristle; hind femur with long bristly hairs on the ventral side, hind tibia a little curved, 1 inner submedian bristle, a row of anterior bristles, the last submedian thicker and placed opposite the inner ones; the postero-dorsal edge with a further row of bristles.

Abdomen black, whitish grey dusted and showing large spots which change with the

---

[1] The following abbreviations of bristles are used in the descriptions:

Head-bristles: iv = inner vertical; ev = outer vertical; pvt = post-vertical; oc = ocellar; paf = parafrontal and parafacial; f = frontal; fo = fronto-orbital.

Thoracic bristles: ac = acrostichal; dc = dorso-central; ia = intra-alar; ph = post-humeral; h = humeral; prs = praesutural; sa = supra-alar; n = notopleural; pa = postalar; sc = scutellar; st = sternopleural; pp = propleural; pst = prostigmatic.

incidence of light; densely beset with half-erected, long hairs, but no strikingly thick bristles, sternites free. Postabdomen black, constructed as in other *Hoplacephala* species, consisting of 3 free segments, namely the narrow 6th, the united 7th and 8th (first genital segment) and the epandrium (second genital segment). Cerci free, curved to the inner side in frontal view; paralobi finger-like, parameres hook-like; phallosome simple, ventral part denticulate (fig. 1).

Female.—I received 3 females which are not fit for description. The wings are not expanded, the legs shrunken and the ptilinum not retracted so that the head is deformed. But it may be stated that in general appearance they are similar to the males and not differently coloured as in many *Hoplacephala* species. Eyes not as densely haired as in the male.

Length : 9–10 mm.

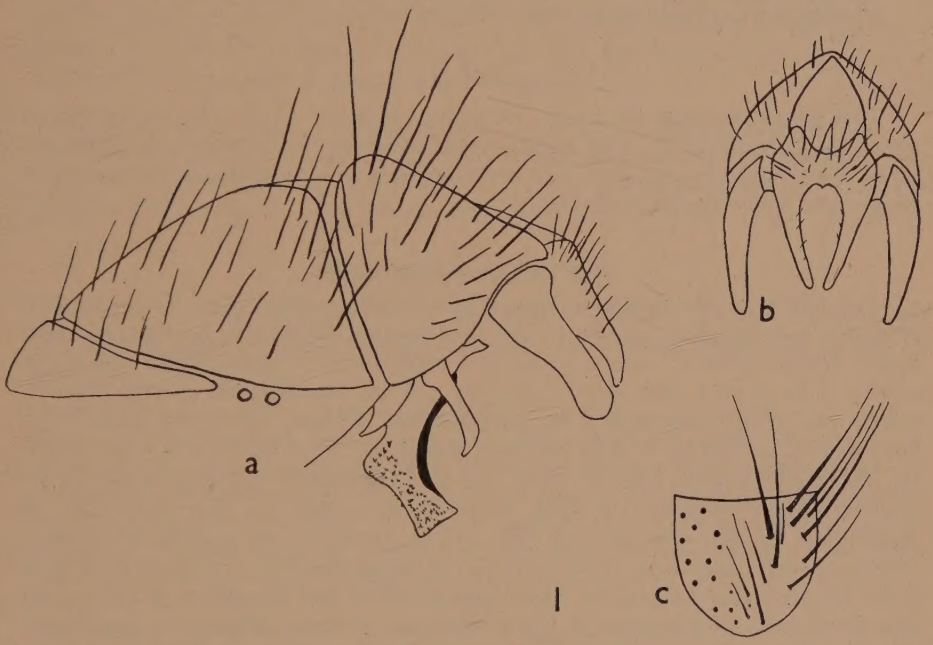

FIG. 1.—Terminalia of *Termitometopia skaifei* gen. et. sp. n., ♂. (*a*) Lateral view, (b) frontal view, (c) fifth sternite.

Distribution : 9 ♂, 3 ♀ from Hout Bay near Cape Town, ix.1950, collected by Dr. S. H. Skaife in a nest of *Amitermes atlanticus*. The collector also records the larvae from nests of *Microcerotermes malmesburyi*. Holotype (♂) and 4 paratyes (2 ♂, 2 ♀) in the collection of the South African Institute for Medical Research, Johannesburg.

Bionomics : Dr. Skaife kindly sent me the following note on observations made by himself :

" The adults emerge in September and the beginning of October. Many of them seem to be unable to expand their wings and even those with expanded wings are feeble fliers and take to flight reluctantly. I know nothing about the oviposition. In late November I find small white larvae in the mounds of *A. atlanticus* and these grow slowly and reach full size by March or April. They are then about half an inch long and they burrow into the wall of the mound,

near the upper surface, and change into puparia, bright red in colour. Early in the following September these puparia turn dark brown just before the flies emerge.

"The larvae are tolerated guests inside the mounds and they are licked and fed by the termites—they do not feed on the termites nor are they scavengers because there is nothing in the mound for them to scavenge. It is obvious in my nests that the workers enjoy licking the fly larvae and I have often seen a worker with its mouth applied to that of the larva and I assume that the worker is giving the larva some sort of liquid food. The larvae live freely in the cells of the mound and move about from cell to cell being able to squeeze through quite small holes."

The species is named in honour of the collector.

Hoplacephala Macquart.

This genus is restricted to the Ethiopian Region. A key to the species is given by Curran (1928), who regards *Dichaetometopia* Macquart, *Hoplocephalopsis* Villeneuve, *Hoplocephalina* Villeneuve and *Hoplocephalonia* Villeneuve as congeneric with *Hoplacephala* Macquart.

Capnopteron Rohdendorf.

The following *Miltogramma* species have been recorded from the Ethiopian Region: *maculigerum* Speiser (1910), *hirtimanum* Bezzi (1912), *helvum* Villeneuve (1916), *munroi* Curran (1936) and *cuthbertsoni* Curran (1936). Of these species I have only seen *munroi* Curran. A few undescribed species from S. Africa are in my collection. An examination of these specimens shows that they cannot be placed in *Miltogramma*, the genotype of which is the European *M. pilitarse* Rondani (Seguy, 1941). A striking feature separating all my S. African specimens from the true *Miltogramma* species is the chaetotaxy of mid-tibia. In *Miltogramma* we find only 1 antero-dorsal submedian bristle, whereas the S. African species show 2–3 of these bristles. Séguy (1941) used this character to separate the Brachycomini from the Metopiini (p. 38). I do not think that this feature or the other ones given by Séguy are important enough to be used for tribal classification, but it is true that mid-tibial chaetotaxy is at least of generic importance and hence the S. African species are placed in a separate genus. Probably all Ethiopian "*Miltogramma*" species belong to this genus, and the true *Miltogramma* are confined to the Palaearctic Region as already postulated by Townsend (1938).

The genus-name referable to the Ethiopian species is *Capnopteron* Rohdendorf (1934), which was based, as a subgenus of *Miltogramma*, on *maculigerum* Speiser. The subgeneric features given by the author are mostly specific ones for *maculigerum* and do not apply to the other species. *Capnopteron* Rohdendorf is identified according to the key of the Miltogrammini-genera given above.

Taxigramma Perris.

Cuthbertson (1937) recorded *T. bisetosa* Villeneuve from Salisbury, S. Rhodesia. I have before me one of these specimens, which was identified by Curran as *T. biseta* Villeneuve, a species described from Madagascar (Villeneuve, 1916). Cuthbertson's name, *T. bisetosa*, is therefore an erratum. At present

I cannot say whether the Rhodesian and Madagascan specimens are really identical.

Craticulina Bezzi.

This genus is, according to Townsend (1938), distributed over the Palaearctic Region extending to S. Asia, but I have before me a few species from S. Africa, e.g., *Craticulina tabaniforme* F. The genus will be discussed in a coming paper.

Paraphylloteles gen. n.

Miltogrammini with leaf-like flattened arista in the male have been recorded so far only from the Palaearctic Region. Townsend (1935 : 202) listed the genera *Phylloteles* Loew (Europe), *Medomyia* Rohdendorf (Persia) and *Chaetophylloteles* Rohdendorf (Baluchistan). From Dr. M. Hesse, South African Museum, I received one male of this group from the Cape Province, which represents a new species and a new genus.

Paraphylloteles is related to *Phylloteles*, but the ocellar bristles are divaricate (not proclinate or reclinate as in the Palaearctic genera), eyes hairy, parafrontalia with one row of parafrontals, vibrissa present, sternopleurals 2 : 1, mid-tibia with one antero-ventral median bristle, R_5 open at apex. Type species : *Paraphylloteles hessei* sp n.

Paraphylloteles hessei sp. n.

A species easily recognizable by the generic features given. There is, so far, no other SARCOPHAGINAE with leaf-like arista known from the Ethiopian Region.

Male.—Frons at the narrowest part one-third as wide as the longest eye-diameter, slightly widened posteriorly, parafrontalia and parafacialia whitish dusted. Chaetotaxy : iv and ev present, one pair of pvt and one of divaricate oc, 1 f and 3 fo ; paf in one row and reaching the base of the second antennal segment ; upper half of the parafrontals with black hairs, with shorter white hairs in the lower half and on the parafacialia ; buccae narrow, one-fifth as broad as the eye is long, densely beset with thin and relatively short brown hairs. Eyes oval (2 : 3), inner facets bigger than the outer ones merging into one another. Second antennal segment brown, with a long bristle on the dorsal side ; third segment black, about 3 times as long as the second ; arista dark brown in the basal part, light brown in the flattened part, beset with fine short hairs (fig. 2).

Vibrissa thick and well developed, a few short bristles on the facial ridge up to the tip of the third antennal joint. Palpi brown, dilated to the tip, a few longer hairs on the ventral margin ; proboscis brown, short.

Thorax black, with whitish dust forming a pattern of three broad longitudinal black stripes. Chaetotaxy : ac = 2 + 3, dc = 2 + 3, ia = 0 + 2, ph = 1, h = 2, prs = 1, n = 2, sa = 3 ; scutellum with 3 strong marginal bristles and one weaker discal, but besides these as on the mesonotum beset with long, erected hairs. Prostigma black, propleural and prostigmatic bristles present. Prosternum apparently bare.

Wings hyaline, veins brown, R_5 narrowly opened at the tip, m with a right angle ; no continuation of m_{1+2} beyond this angle ; costal spine and setae on the veins, except the costa, wanting. Halteres yellow-brown.

Legs black, front femur with a row of strong antero-dorsal bristles, front tibia with 1 antero-ventral submedian bristle ; mid-tibia with 1 antero-ventral and 1 antero-dorsal submedian bristle ; hind femur on the ventral side with a strong subapical bristle and a few bristly hairs before it, hind tibia with 1 antero-ventral median bristle and a dense row of antero-dorsal bristles in the upper half, on the postero-dorsal side with 2 median bristles.

The chaetotaxy of the legs is difficult to define fully, the single specimen being in such a condition that it cannot be re-mounted without danger of damaging it.

Abdomen shining black, the tergites with very narrow brown hind margins. Whitish dust forming two large lateral spots on the 2nd and 3rd visible tergites, 4th tergite wholly dusted; however, the pattern is indistinct and varies with the light incidence. All tergites densely beset with black, semi-erect hairs; hind margin of the second visible (= 3rd) tergite with a pair of short, erect, median bristles, hind margins of the following segments with a row of bristles. The last two sternites partly covered by the margins of the tergites. Hypopygium black; no further details of it can be given, there being only one specimen available.

Length: 6 mm.

Female.—Unknown.

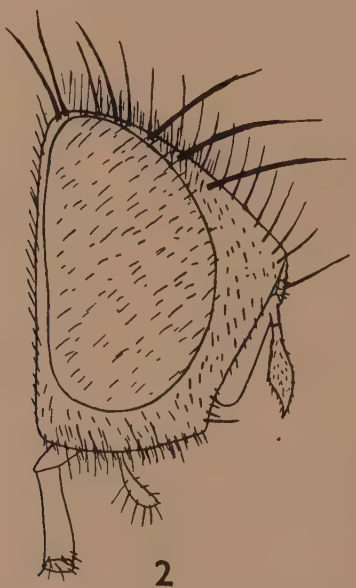

Fig. 2.—Lateral view of head of *Paraphylloteles hessei* sp. n., ♂.

Distribution: One male from Cape Province, Spitzkop, Meirings Poort, January, 1935, collected and sent in by Dr. M. Hesse, to whom this interesting species is dedicated. Type in the collection of the South African Museum, Cape Town.

Setulia Robineau-Desvoidy.

Curran (1936) tabulated the Ethiopian species known to him under the genus *Pterella* R.-D., which, like *Thereomyia* Rohdendorf (1927), is regarded as a synonym of *Setulia* R.-D. He did not mention *S. obscurior* Villeneuve, described by this author as a variety of the Palaearctic *fasciata* Meigen. A comparison of the terminalia (cf. Séguy, 1941: 262, fig. 364 and fig. 3) shows that we are dealing with two good species.

The *Setulia* species from the Ethiopian region may be separated as follows:

1 (2) Abdomen mostly reddish in ground-colour. Unknown to me.—Brit. E. Africa . . . . . *rubriventris* Villen. (1913)

2 (1) Abdomen not or only obscurely reddish 3
3 (4) Dorsal side of the abdominal tergites with isolated round black spots. Thorax and abdomen brownish dusted. 6–7 mm.—Orange Free State . . . . . *triseriata* Curr. (1936)
4 (3) Dorsal side of the abdominal tergites with transverse bands . . . 5
5 (6) Abdominal tergites shining black with narrow yellow posterior margins ; front margins of the 2nd–4th visible segments with whitish dusted transverse bands covering 1/5–1/3 of the segment. 6–11 mm.—S. and C. Africa up to Egypt . . . . *obscurior* Vill. (1916)
(Syn. *angustifrons* Vill., 1916, ? *aegyptiaca* Rohd., 1934.)
6 (5) Abdominal tergites of the male, with the exception of the last one, brownish dusted. Narrow yellow posterior margins, front margins of a lighter colour than the remaining middle part of the segment. 6–8 mm.—S. Africa . . . . . *africana* Curr. (1936)

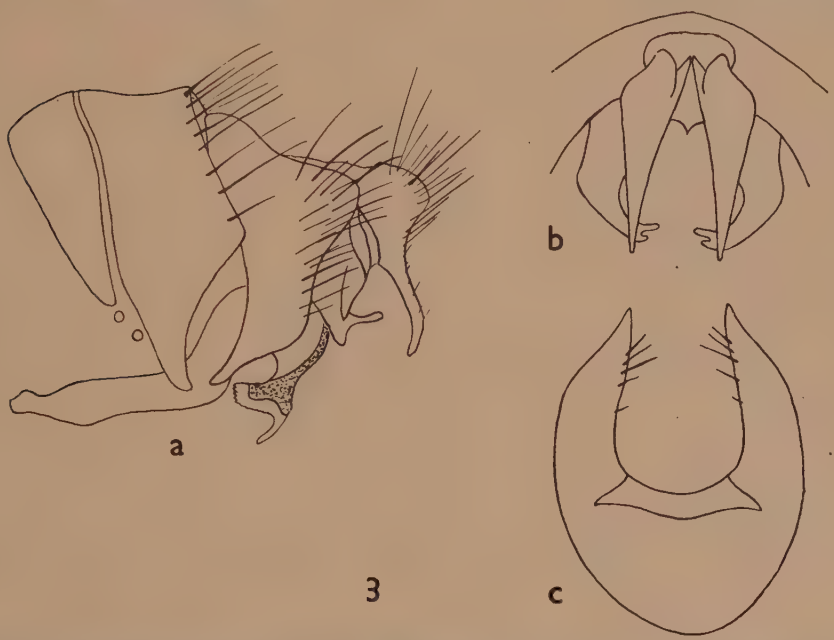

Fig. 3.—Terminalia of *Setulia obscurior* Villeneuve, ♂. (a) Lateral view, (b) frontal view, (c) fifth sternite.

Pachyophthalmus Brauer & Bergenstamm.

Curran (1936) listed two Ethiopian species under the generic name *Amobia* R.-D., but according to Séguy (1941) *Amobia* R.-D. is a synonym of *Macronychia* Rondani and Curran's species belong to *Pachyophthalmus* B. B. I have seen typical specimens of both these species and found that they are conspecific, so that I regard *P. capensis* Curran as a synonym of *P. africa* Curran, the number of the sternopleural setae, used by Curran to separate his two species, being variable.

Senotainia Macquart.

This genus seems to be well represented in the Ethiopian region, but the species belonging to it are mostly listed under *Lamprometopia* Macquart.

According to Curran (1936) and Townsend (1938), the outstanding features of *Lamprometopia* are haired eyes in both sexes or at least in the male and only one antero-dorsal median bristle on the mid-tibia. But the hairs on the eyes are not a constant generic feature. In some species both sexes have distinctly hairy eyes, in others only the eyes of the males are pilose, in still other species they may even be totally bare. Those specimens with bare eyes are no more generically separable from *Senotainia* Macquart, and I, therefore, unite *Lamprometopia* Macquart with this genus.

One Palaearctic species, *S. albifrons* Rondani, has also been found in S. Africa (Cuthbertson, 1937). I examined two of these specimens recorded by Cuthbertson from S. Rhodesia, and two further ones from the Cape Province, identified by Villeneuve. By the kindness of Mr. Oldroyd, British Museum (Natural History), I received a male of *S. albifrons* from Palestine and compared the male terminalia of this specimen with those from S. Rhodesia (fig. 4). Both

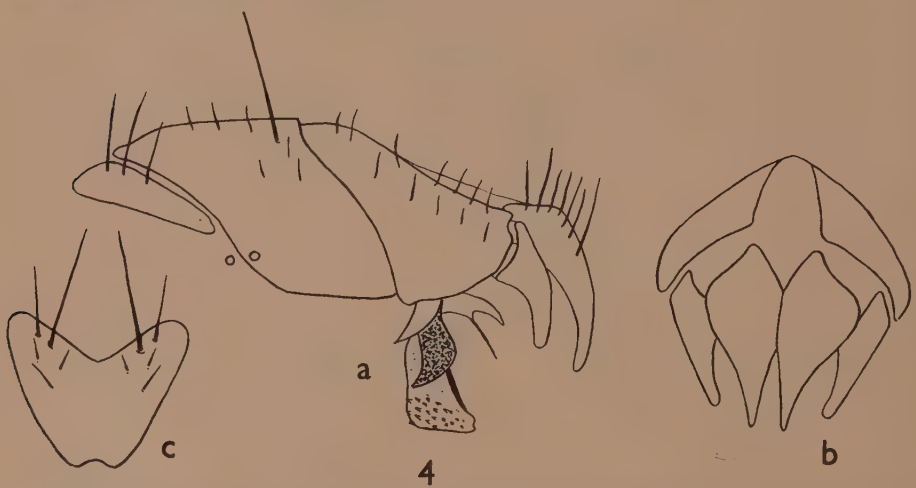

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FIG. 4.—Terminalia of *Senotainia albifrons* Rondani, ♂. (a) Lateral view, (b) frontal view, (c) fifth sternite.

are identical, so now there is no doubt that we are dealing with the same species.

I have before me some new species, two of which are described in this paper.

Senotainia nuda sp. n.

This species is characterized by 3 fo, a distinct pattern on thorax and abdomen, a yellow-reddish ground-colour of the abdomen and bare eyes in both sexes.

Male.—Frons at the narrowest part one third as wide as the eye is long, slightly widened anteriorly and posteriorly; frontal stripe yellow-brown dusted, parafrontalia light yellow, parafacialia and bucca white dusted. Chaetotaxy: iv and ev present, 1 pair of pvt and 1 pair of proclinate oc, 1 f and 3 fo, paf reaching middle of second segment, parafrontalia and parafacialia white dusted and beset with short setae; vibrissa well developed, above it one or two bristles; peristome with a row of bristly black hairs which become thinner posteriorly; buccae one-sixth as broad as the eye is long, beset with fine and short white

and dark hairs. Eyes oval (2 : 3), facets bare, those of the inner part a little bigger than of the outer, merging into one another. Antennae with the first two segments brown, the third dark-brown to black ; 2nd segment with a long dorsal bristle, 3rd with a long arista reaching beyond the vibrissa ; only the basal fifth of the arista thickened, pilosity very short. Palpi slender, dark brown, with a few long hairs on the ventral margin ; proboscis black, short and with well-developed labella.

Thorax grey dusted, in front of the suture with two narrow longitudinal stripes and a lateral oblique spot ; pattern behind the suture indistinct. Chaetotaxy : mesonotum with sparse but long hairs, between which the bristles are only more or less distinct. Prescutellar ac long, furthermore 2 presutural ones distinct, dc = 2 + 3, ia = 0 + 2, h = 2, ph = 1, prs = 1, n = 2, sa = 3 ; scutellum with 4 pairs of bristles including the discal ones. Prostigma black, sternopleura with 2 bristles (1 : 1) and a few additional long hairs. Propleura and prosternum bare ; 1 long and 1 short prostigmatic and 2 long and 1 short propleural bristles.

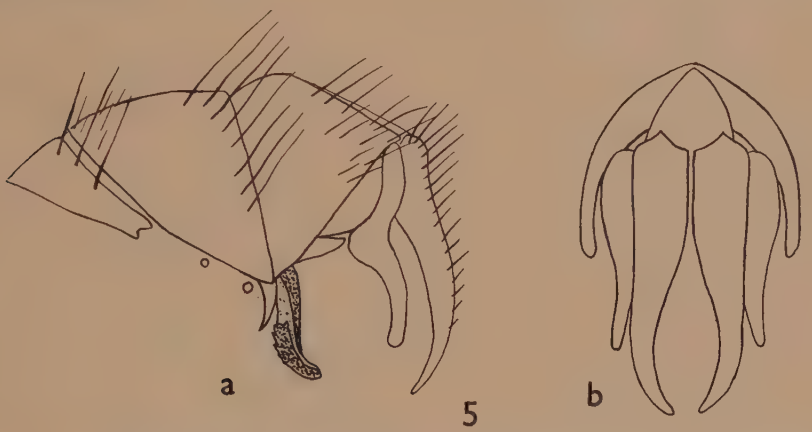

FIG. 5.—Terminalia of *Senotainia nuda* sp. n., ♂. (a) Lateral view, (b) frontal view.

Wings hyaline, veins yellow-brown, R_5 open, m with a blunt angle, no continuation beyond it ; costal spine very short, inconspicuous, all veins except the costal vein bare ; calypter broad truncate, yellowish, bare.

Legs black, front femur with a row of long ventral and postero-dorsal bristles, front tibia with 1 postero-ventral median bristle ; mid-femur in the basal half with a few long ventral bristles, mid-tibia with 1 antero-dorsal and 1 antero-ventral submedian bristle, and with two short posterior median bristles ; hind femur with a long subapical ventral bristle and a few in the basal half, in addition a row of antero-dorsal ones ; hind tibia with a row of antero-dorsal bristles, and 1 antero-ventral submedian bristle ; claws of all legs short.

Abdomen with a reddish-yellow ground-colour, at least the first two visible segments yellow-brown dusted ; the dark pattern consists of a broad, ill-defined spot on the first segment, three triangular spots on the 2nd and 3rd segments, the middle spots being long and narrow reaching the front margins, whereas the lateral ones are broad and only reach the middle of each segment ; last segment nearly totally darkened. Postabdomen black ; three free segments, cerci converging ; paralobi slender, phallosome simple (fig. 5).

Female.—Similar to the male ; frons narrowest at vertex and here two-thirds as broad as the eye is long, widened to the antennal groove, frontal stripe red-brown in the lower third, otherwise black and grey dusted, parafrontalia and face white dusted. Chaetotaxy and other features as in the male.

Length : 5–7 mm.

Distribution : 1 ♂ (holotype) and 1 ♀ from TRANSVAAL, Pretoria, 30.i.1949 ; and 1 ♂ from TRANSVAAL, Johannesburg, 2.i.1950. All specimens in the collection of the South African Institute for Medical Research, Johannesburg.

Senotainia cuthbertsoni sp. n.

From Dr. G. F. Cockbill, Department of Research, Salisbury, I received a series of 11 ♂ and 13 ♀ collected by the late Mr. Cuthbertson near Durban. These specimens are extremely interesting, showing a wide and unexpected range of variability. It is already known that the body-size of the Miltogrammini is dependent to a great extent on environmental factors, such as nutrition, but this series also reveals that the chaetotaxy, and especially that of the head, is not at all constant. The number of the fronto-orbital bristles is often used as a specific and even generic feature, but the specimens before me, which without doubt all belong to one species, show 3–5 fo, which are sometimes even asymmetrically arranged. Such a great variability in the chaetotaxy is known to occur in the species of *Sarcophaga*, so that when identifying most of them the only reliable features are the male genitalia. I am convinced that the same proves true for many of the Miltogrammini.

The male is similar to *caffra*, from which, however, it can readily be separated by a subparallel frontal stripe reaching the vertex of the head. In *S. caffra* the frontal stripe is elongate triangular, reaching the ocellar triangle as a narrow line. The female of the new species has at least 3 fo and shows three black longitudinal stripes on the grey-dusted mesonotum.

Male.—Frons at the narrowest part near the vertex a little more than one-fourth as wide as the eye is long (11–12 : 40–41), frontal stripe black, subparallel, slightly widened anteriorly, parafrontalia white dusted ; at the vertex each as wide as the frontal stripe ; parafacialia and buccae dusted like the parafrontalia. Chaetotaxy : iv long, ev short and thin, 1 pair of pvt, oc divaricate, surrounded by some shorter and thinner hairs ; f almost in the same row as the parafrontalia so that it can be taken for the last paf ; 4–5 fo, in some specimens asymmetrically arranged, paf reaching 1st antennal segment ; besides these bristles the parafrontalia and parafacialia are densely beset with black setae ; vibrissa well developed, above it with 2–3 short bristles, peristome with a row of black bristles ; buccae one fourth as broad as the eyes is long, densely beset with short black hairs. Eyes densely haired, the inner facets a little bigger than the outer ones, merging into one another. Antennae black, 2nd segment with one or two long dorsal bristles, 3rd segment about twice as long as the second, arista reaching beyond the vibrissa, thickened only at the base ; pilosity relatively long, some of the setae a little longer than the thickened base of the arista. Palpi slender, black, proboscis black, labella well developed.

Thorax shining black, slightly whitish dusted, mesonotum with three broad longitudinal black stripes which are more or less indistinct in the posterior part. Chaetotaxy : ac 2 + 1–2, dc = 2 + 3, ia = 0 + 2, h = 2, ph = 1, prs = 1, n = 2, sa = 3 ; scutellum with 4 pairs of bristles including the discal ones. Prostigma black, sternopleura with 3 bristles (2 : 1), the lower anterior one shorter and thinner than the upper two, beside these densely beset with black hairs. Propleura and prosternum bare, 1 prostigmatic and 1 propleural bristle.

Wings hyaline, veins brown, R_5 open, with a right angle and a long continuation beyond it ; costal spines well developed, r_{4+5} at the base with a few setae above and below ; calypter broad, truncate, bare, margin narrowly yellow.

Legs black, front femur with a row of long postero-dorsal and a row of long ventral bristles, front tibia with 1 postero-ventral median bristle, and femur with a row of antero-dorsal bristles and about half a dozen antero- and postero-ventral bristles each ; mid-

tibia with 1 antero-dorsal and 1 antero-ventral submedian bristle, and with two short posterior median bristles; hind femur with bristles similarly arranged as on the second femur, hind-tibia with 1 antero-ventral submedian bristle; a row of antero-dorsal bristles and two postero-dorsal bristles; claws of all legs short.

Abdomen black, olive dusted and showing an ill-defined black pattern which consists of a quadrangular middle spot and two triangular lateral spots on the second visible segment; the third segment shows three triangular spots, the lateral ones not reaching the front margin. Postabdomen black; three free segments, cerci a little converging; paralobi slender, phallosome short and stout, tube-like (fig. 6).

Female.—Densely greyish dusted and, therefore, different from the male. Frons at the vertex about two-thirds as wide as the eye is long (22 : 36), strongly widened anteriorly; frontal stripe black, only half as broad as one parafrontalium at the vertex; buccae higher than in the male, two-fifths of the eye-length. Eyes with setae less dense and long than in the male but quite distinctly haired. Chaetotaxy as in the male, but ev longer and thicker

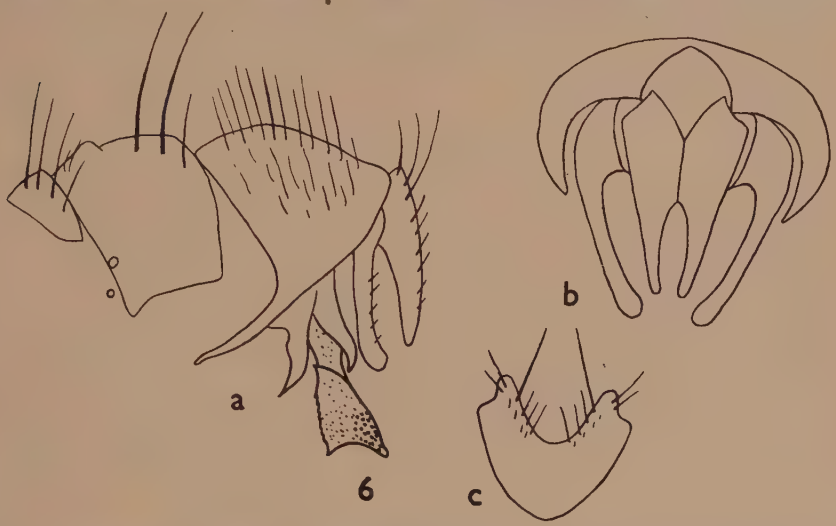

Fig. 6.—Terminalia of *Senotainia cuthbertsoni* sp. n., ♂. (a) Lateral view, (b) frontal view, (c) fifth sternite.

and f placed aside the paf and distinctly recognizable as a frontal bristle; furthermore, the fo may be reduced to three, but usually four are present.

Thorax with smaller and, on account of the denser dust, with more striking longitudinal stripes; chaetotaxy as in the male. Abdomen dusted like the thorax, triangular spots also visible on the first segment; middle spot of the second visible segment more or less triangular also, not quadrangular as in the male.

Distribution: 11 ♂ and 13 ♀ from Natal, Durban, October, 1941, leg. Cuthbertson. Holotype (♂) and 17 paratypes returned to the Entomological Branch, Department of Research, Salisbury, 3 paratypical pairs in the collection of the South African Institute for Medical Research, Johannesburg.

The species is named in honour of the collector, the late Mr. A. Cuthbertson.

Senotainiella gen. n.

From the South African Museum, Cape Town, I received 2 ♂ of a Miltogrammini species identified by Villeneuve as *Pachyophthalmus signatus* Meigen. These

specimens were collected near Kloof, Natal coast. *P. signatus* is a holarctic species, and it was, therefore, doubtful if its area of distribution extended to S. Africa. A comparison with the description given by Séguy (1941) made it clear that the S. African specimens could not belong to this species. Furthermore, these specimens showed features which do not allow them to be placed in this genus at all. I believe that they form a new genus which is related to *Senotainia* Macquart, and may be, therefore, called *Senotainiella*. It is characterized by the following features:

Frons angled in profile; parafrontalia with one row of strong parafrontals which may be partly irregular and there are not 2 regular and complete rows as in *Pachyophthalmus*; fronto-orbitals wanting; parafrontalia beside this row of parafrontals densely beset with long black and erect hairs; vibrissa well developed; arista long, nearly bare, thickened only in the basal third, tip surpassing the vibrissa. Eyes bare. Wing-cell R_5 open, m with right angle. Mid-tibia with 1 antero-dorsal submedian bristle. Postabdomen with the 6th tergite free, spiracles VI and VII in the membrane, paralobi cerci-shaped, phallosome simple, without appendages. Type species: *Senotainiella decolor* sp. n.

Senotainiella decolor sp. n.

A dark and densely haired species which looks somewhat similar to members of the genus *Sarcophaga*.

Male.—Frons narrowest at vertex and here one-third as broad as the eye is long, slightly widened to the antennal groove; frontal stripe and parafrontalia black, parafacialia yellow, buccae grey dusted. Chaetotaxy: iv and ev present, no ocellar bristles, but ocellar triangle with a bunch of black hairs which extend to the vertex; 1 strong reclinate f; paf reaching 1st antennal segment, parafrontalia also densely beset with long erect hairs; parafacialia dusted only, without hairs; vibrissa long and thick, vibrissarium up to one-third of the facial ridge densely beset with bristly hairs; buccae relatively narrow, one-fifth as broad as the eye is long, beset with black hairs and longer bristly hairs on the peristome. Eyes oval (3 : 5), facets bare, on the inner part of the eye a little larger than on the outer, but merging into one another. Antennae black, second segment with a long dorsal bristle, third segment about twice as long as the second, arista long, surpassing the vibrissa, thicker in the basal third, nearly bare, covered only with microscopic hairs. Palpi slender, with long bristly hairs on the ventral margin; proboscis black, short, labella well developed.

Thorax black, two median longitudinal, relatively broad stripes grey dusted and extending to the tip of the scutellum, ventral sides of mesonotum and pleura similar dusted as the median stripes. Chaetotaxy: mesonotum densely beset with long erect and black hairs, among which the ordinary bristles are more or less indistinct. Recognizable are one pair of prescutellar ac, dc = 1 + 4, ia = 0 + 1, h = 2, ph = 1–2, prs = 1, n = 3, sa = 1, scutellum with 3 pairs of marginal bristles, no discal ones. Prostigma black, sternopleura densely beset with black hairs and two long bristles (1 : 1), below the former with two bristly hairs which are thicker than the remaining hairs. Propleura and prosternum bare, 2 prostigmatic and 4 propleural bristles.

Wings hyaline, veins brown, R_5 widely open, m with a right angle, no continuation beyond it, costal spine wanting, all veins except the costal vein bare; calypter broad, truncate, bare, white with a broad yellow margin. Halteres light brown.

Legs black, front femur with a row of long bristles on the dorsal and ventral side, front tibia with 1 antero-dorsal submedian bristle and 2 median postero-ventral bristles; mid-femur with 2 subapical postero-dorsal bristles and a row of bristles on the ventral side, mid-tibia with 1 submedian antero-dorsal bristle, 1 antero-ventral and 2 median posterior ones; hind femur with a row of long antero-dorsal bristles and long bristles on the ventral side, hind tibia with 1 median antero-ventral bristle and a row of long dense

antero-dorsal bristles on the postero-dorsal edge with 3 long bristles in the upper half and a subapical one in the lower half.

Abdomen grey dusted with three longitudinal rows of more or less triangular olive spots. This pattern is not well marked and changes a little with the light incidence. First and second visible segments with a pair of erect median marginal bristles, third and fourth with a row of marginals. Fifth sternite notched in the middle up to half of the sternite and provided with 3 long bristles on each margin. Postabdomen black, consisting of three free segments, cerci diverging a little, paralobi long, triangular in profile, phallosome simple, tube-like (fig. 7).

Length : 9 mm.

Female.—Not known.

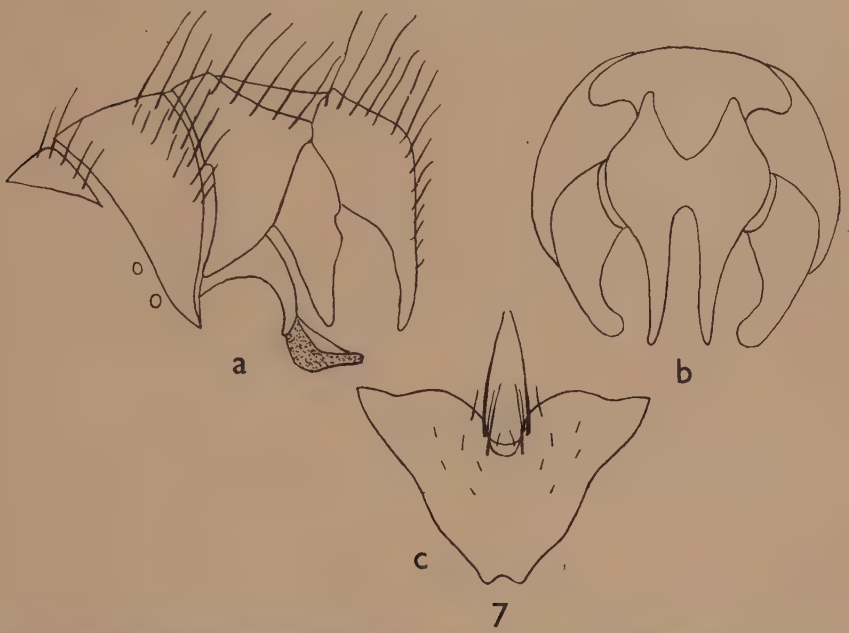

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Fig. 7.—Terminalia of *Senotainiella decolor* gen. et sp. n., ♂. (a) Lateral view, (b) frontal view, (c) fifth sternite.

Distribution : 2 ♂ from Natal, Kloof near Durban, 1.xi.1917. Holotype in the collection of the South African Museum, Cape Town, paratype in the South African Institute for Medical Research, Johannesburg.

III. Remarks on the Ethiopian Agriini.

To this tribe belongs the well-known *Wohlfahrtia* B. B. I have not yet seen other genera from the Ethiopian Region. Two species from South Africa recorded by Curran (1934) as *Agria munroi* Curran and *A. condoa* Curran do not belong to this genus, but represent at most a subgenus of *Sarcophaga s. lat.*

IV. A New Ethiopian Genus of the Sarcophagini.

Xiphidiella gen. n.

Villeneuve (1920) described from the Cape a new species of Sarcophaginae which he named *Hoplocephalella anorubra*. The author only examined one

female, of which he gave a short but sufficient diagnosis so that it was not difficult to recognize four further specimens (2 ♂, 2 ♀) in the collection of the South African Museum, Cape Town.

Villeneuve placed this species in the genus *Hoplocephalella* which he erected in 1913 for *H. signata* Villeneuve = *caffra* Macquart. I have a paratype male of *signata* before me. It belongs to the genus *Lamprometopia* (= *Senotainia*) as already stated by Townsend (1931). *H. anorubra*, however, cannot be placed in this genus and is also not similar to *S. caffra* in general appearance. It rather bears a likeness to a small *Wohlfahrtia* species, as already mentioned by Villeneuve.

The examination of the male terminalia revealed quite unexpected results. There is no free 6th tergite as in the Miltogrammini, and this segment is also not indicated by a suture or a row of bristles as in the Agriini, but it seems to be totally reduced. This species, therefore, should be placed in the Sarcophagini, in which tribe it represents a striking new genus. *Xiphidiella* is characterized among the Sarcophagini by the following features :

Posterior margin of the hind coxae bare ; eyes hairy in the male, bare in the female, arista very shortly pilose ; mesonotum with presutural acrostichal and two notopleural bristles ; sternopleural 1 : 1, R_5 narrowly open at the tip ; abdomen with fixed rounded black spots ; hypopygium of male consisting of two segments, the first without hairs and with no indication of a fused 6th tergite ; 6th spiracle in the intersegmental tissue ; 2nd genital segment with free cerci and cerci-like paralobi ; phallosome simple, without appendages as in the genus *Sarcophaga*. Type species : *Hoplocephalella anorubra* Villeneuve.

Xiphidiella anorubra (Villeneuve 1920).

H. anopubra, Villeneuve, 1920, *Rev. Zool. Afr.* **8** : 157–158.

X. anorubra is characterized, apart from the generic features, by five rounded black spots on the 2nd to 4th abdominal tergites and red terminalia in both sexes.

Male.—Frons at the narrowest part nearly half as wide as the eye is long (4 : 9·5), widened posteriorly and anteriorly, frontal stripe black ; parafrontalia and parafacialia broad and, like the remaining part of the head, white dusted. Chaetotaxy : iv and ev present ; one pair of pvt and one of divaricate oc ; parafrontals in one row and reaching the first antennal segment ; 1 f and 3 fo, parafrontals and parafacialia sparsely beset with additional thin and short hairs ; buccae about one-third as high as eye is long, with sparse thin hairs as the parafacialia but the peristome with a row of black bristles which continue beyond the vibrissa on the facial ridge up to the tip of the third antennal segment. Eyes oval (2 : 3), facets of nearly equal size, distinctly haired. Second segment of antennae red-brown, about half as long as the third, with a long dorsal bristle, the third black ; arista long, surpassing the vibrissa, shortly pilose. Palpi slender, of nearly equal size, a little curved and darkened to the tip, with long bristles on the ventral margin. Proboscis dark brown.

Thorax black, with a pattern of white dust forming two pairs of broad longitudinal stripes. Chaetotaxy : ac = 2 + 1, dc = 2 + 3, ia = 0 + 1, ph = 1, h = 2, prs = 1, n = 2, sa = 2, scutellum with 3 pairs of marginal and 1 pair of discal bristles. Prostigma black, propleural and prostigmatic bristles present, propleura and prosternum bare.

Wings hyaline, costal spine wanting, veins brown, r_{1+2} bare, r_{4+5} with a few hairs on the upper side halfway to cross-vein, m with a right angle and reaching the costal vein just beside r_{4+5} so that R_5 is only very narrowly open. Halteres yellow.

Legs black, front-femur with long bristles ventrally and dorsally, front tibia with a median posterior bristle ; mid-femur with an apical comb consisting of 4–5 short spines,

behind this with long and rather dense hairs, mid-tibia with 1 long submedian antero-dorsal bristle, the lower half of the inner side with a short brush of hairs which just reach the tibial diameter ; hind femur with a row of antero-dorsal bristles and long dense bristly hairs on the ventral side, hind tibia a little curved, with short dense hairs on the inner side which do not reach half of the tibial diameter, 1 antero-ventral submedian bristle, 2 antero-dorsal median bristles but with additional bristles which are also strong and about as long as these two median bristles, 2 posterior median bristles ; claws of all legs long and thin, with long pulvilli.

Abdomen with the exception of the first black visible segment red-brown with rounded black spots. The red-brown ground is densely whitish dusted, the spots are large and more or less oval, the lateral ones touch the front margin but do not reach the hind one ; the three inner spots touch the hind margins but do not reach, except the first middle spot, the anterior margins ; second and third segments with a pair of erected median marginal bristles,

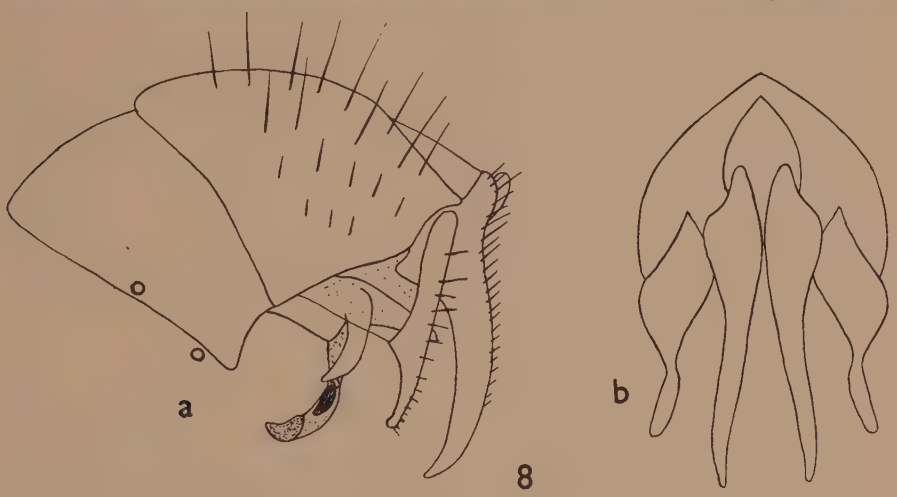

FIG. 8.—Terminalia of *Xiphidiella* gen. n. *anorubra* (Villeneuve), ♂. (a) Lateral view, (b) frontal view.

fourth tergite with a row of marginal bristles. Sternites beset with long hairs, the margins of the 3rd and 4th covered by the tergites ; 5th sternite bifid as in the *Sarcophaga* and *Wohlfahrtia* species and with a comb of short spines on the inner margin. Postabdomen red ; first genital segment bare, 6th spiracle in the intersegmental tissue ; cerci slender, diverging in frontal view ; paralobi cerci-like ; phallosome slender without any appendages (fig. 8).

Female.—Frons narrowest at the vertex and here two-thirds as wide as eye is long (3 : 4·5), constantly widened to the antennal groove. Chaetotaxy of head as in the male, but eyes bare. Thorax as in the male. Legs without an apical comb on the mid-femur and without denser hairs on the mid- and hind tibiae. Ground-colour of the abdomen black, whitish dusted and with the same pattern as in male, but the spots are a little smaller and the first of the median row does not touch the front margin of the segment. Terminalia red.

Length : 7–9 mm.

Distribution : Villeneuve received his single female from Dr. Brauns, Willowmore, Cape Province, and it is probable that the fly was collected there. The specimens before me were collected in Cape Province, Richmond district, iii.1931 (1 ♀) ; Cape Province, Murraysburg district, iii.1931 (1 ♀) ; Cape

Province, Wupperthalside, ix.1926 (1 ♂); and Orange Free State, Caledon R., between Bethulie-Aliwal North, (1 ♂).

Acknowledgments.

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SOME DERMAPTERA FROM SIERRA LEONE.

By W. D. Hincks, M.Sc., F.R.E.S.
(*Manchester Museum.*)

With the exception of a few species originally described from Sierra Leone and a small number of records in papers dealing with other countries, practically nothing has been written regarding the Dermaptera. The present notes are based on a small but interesting collection of 183 specimens sent for identification by the Commonwealth Institute of Entomology. The material was collected by Mr. E. Hargreaves, much of it by using a light-trap, and it is probable that this method of collecting is responsible for much of the interest of the collection. Excluding 8 nymphs which cannot be identified, 18 species are included, two of them new to science, one being represented by 14 and the other by no less than 40 specimens. The latter (*Geracodes labioides* sp. n.) is a remarkable Brachylabine with fully developed organs of flight, a character hitherto entirely unsuspected in this subfamily, which has long been regarded as an essentially flightless group.

The writer is indebted to Dr. W. J. Hall, C.M.G., M.C., for allowing him to study this valuable series, which, with the exception of a few duplicates, will be deposited in the collections of the British Museum (Nat. Hist.).

Pygidicranidae.

Diplatys macrocephalus (Palisot de Beauvois).

Forficula macrocephala Palisot de Beauvois, 1805, *Ins. Afr. Amer.*: 36, Orth. pl. 1, f. 3 (♂, Benin).

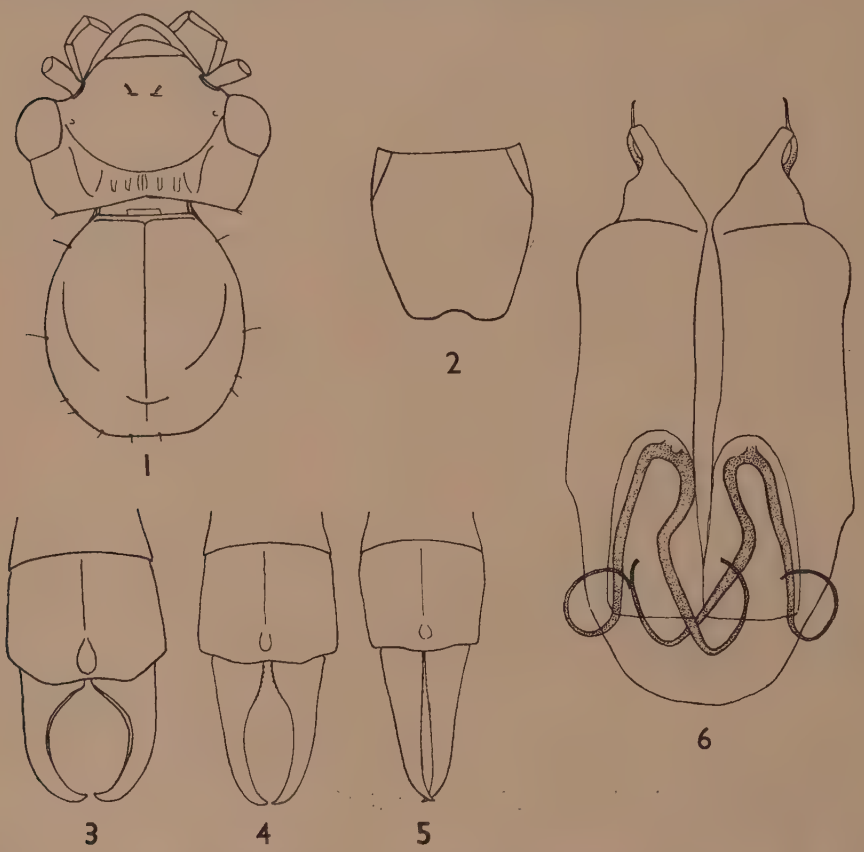
This is a widely distributed West African species which does not appear to have been reported previously from Sierra Leone. Although the five specimens in the present collection are all females there is no doubt as to their identity as they have been compared with material in the Burr collection from several African localities and with a series from Belgian Congo belonging to the Musée du Congo Belge. The latter material is referred to in some detail in the first part of the writer's revision of the Dermaptera of the Belgian Congo, (*Ann. Mus. Congo Belge, Zool.* **8**: 1-50).

The present series is from Njala, 17.x.30, 7.iii.32, 4.iv.32, 1.v.32, and Moyamba, 12.ii.25.

Diplatys rotundicollis sp. n. (figs. 1–6).

Coloration similar in both sexes, liver-brown, extreme base of tegmina, base of abdomen, antennae and forceps lighter brown; pronotum and legs testaceous; latter having distal one quarter of all femora somewhat infuscated, as also are the tibiae proximad, but less distinctly; tarsi sometimes infuscated. In the female the pronotum and femora are extensively infuscated. *Head* simple in both sexes; in male (fig. 1) frontal area slightly tumid, gradually passing into the slightly depressed occiptal area; latter unusually short, at median longitudinal suture barely half length of cheeks, with an ill-defined depression on each side; transverse sutures feebly indicated; post-ocular carinae entirely absent. Head of female less tumid and occiput less depressed. *Antennae* 20-segmented; first segment stout, about as long as second to fourth combined; third and fifth subequal in length, considerably longer than fourth; sixth longer than fifth but shorter than seventh, following segments elongate, subcylindrical. *Pronotum* (fig. 1) longer than broad, sides

somewhat rounded; pro- and metazona little differentiated. *Tegmina* fully developed, about twice as long as pronotum. *Wings* fully developed, scales about as long as pronotum. *Abdomen* of male cylindrical proximad, gradually widening from seventh or eighth tergite; more or less parallel-sided and slightly contracted distad in female. *Ultimate tergite* (figs. 3–5) of male varying in proportions in relation to the development of the forceps; median sulcus distinct from proximal half, replaced in caudal portion of segment by a large, low, median tumidity; in female tergite is longer, sulcus and tumidity less distinct. *Forceps* of male (figs. 3–5) very variable; in individuals with only slightly inflated distal abdomina



Figs. 1–6.—*Diplatys rotundicollis* sp. n. Male. (1) Head and pronotum. (2) Penultimate sternite. (3)–(5) Ultimate tergite and forceps. (6) Genitalia.

tergites they are simple as in the female, straight, almost contiguous throughout their length; rather better developed individuals have the forceps very slightly curved and the proximal third slightly expanded internally; with increased inflation of ultimate tergite differentiation between proximal sublamellate portion and more slender distal portion increases until a form with moderately curved forceps and distinct proximal lamellation is achieved. The combined changes in the ultimate tergite and forceps may be seen in figs. 3–5, and do not appear to be correlated with any marked variation in size. Forceps of female simple, as in simplest form of male. *Penultimate sternite* of male (fig. 2) flat, elongate, with distinct median longitudinal depression; caudal margin simply emarginate mesad; in female free margin rounded triangularly. *Legs* as for genus. *Genitalia* of male

(fig. 6), with digit-like epimerite attached to parameres which are abruptly truncate distad ; virga long and simple.

Length : ♂, 11–12 mm. ; ♀, 12–13 mm.

Types : Described from 9 ♂, 5 ♀. Holotype ♂ and Allotype ♀ SIERRA LEONE : Njala 27.vii.32, 21.v.26 (*E. Hargreaves*) in British Museum (Nat. Hist.). Six paratype ♂, same locality, 17.xi.29, 1.ix.29, 7.xii.30, 14.ii.32, 9.iii.32, and two paratype ♀, same locality " at light, predaceous," 11.iv.25, 9.xii.27, also in the British Museum. Two paratype ♂, 7.iii.32, 11.v.32, and two paratype ♀, 24.v.26, 11.iii.32, in the writer's collection. In addition a damaged pair have been examined, taken " at light " from the same locality, 7.x.25, 2.iii.32.

This interesting species shows a similar variation in regard to the ultimate tergite and development of the forceps in the male to that recorded by the writer (Hincks, 1937, *Ent. mon. Mag.* **73** : 247) for *Diplatys macrocephalus*. The recent examination of several other species, represented however by short series only, suggests that a similar variation may well be found to occur throughout this extensive genus, thus finally invalidating the use of characters derived from the ultimate tergite and forceps for the primary subdivisions of the genus as adopted by Burr (1911, *Trans. ent. Soc. Lond.* **1911** : 21) and all previous students of *Diplatys*.

D. rotundicollis closely resembles in external characters *D. coriaceus* (Kirby, W. F., 1891) also from Sierra Leone. It differs in the male sex in the shorter occipital area of the head (fig. 1) and in having the sides of the pronotum more rounded (fig. 1) ; the ultimate tergite, just before its margin, has a low, relatively large tumidity which is absent or very feebly developed in *D. coriaceus*. The free margin of the penultimate sternite of *D. rotundicollis* (fig. 2) has a simple median concavity ; in *D. coriaceus* this concavity is deeper and bounded laterad by a pair of teeth, the inner being broad and rounded distad, the outer spiniform. The female of *D. rotundicollis* differs similarly from the female of *D. coriaceus* in having a shorter occiput and slightly more rounded pronotum, and averages rather smaller in size. In *D. coriaceus* there is a distinct rudiment of the post-ocular carina visible in the female which is entirely absent in *D. rotundicollis* ; otherwise there appears to be little difference between the females of the two species. The characters of the head and pronotum, however, are diagnostic.

D. rotundicollis belongs to the " coriaceus " group, which is characterized in the male by having a digit-like epimerite attached to the parameres. In addition to *D. coriaceus* (Kirby) the group includes *D. conradti* Burr, 1904, *burri* Hincks, 1936, and *schoutedeni* Hincks, 1937. From all these species *D. rotundicollis* may be distinguished by the truncate distal extremity of the parameres (fig. 6). The genital armature of the above species are fully figured in the writer's revision of the Belgian Congo PYGIDICRANIDAE (*Ann. Mus. Congo Belge, Zool.* **8** : 17).

LABIDURIDAE.

CARCINOPHORINAE.

Euborellia cincticollis (Gerstaecker).

Brachylabis cincticollis Gerstaecker, 1883, *Mitt. naturw. Ver. Griefswald* **14** : 44 (♂♀, Cameroons : Bonjongo and Victoria).

This species has been widely recorded in West and Central Africa, but does not appear to have been noted previously from Sierra Leone. In the present

material there are 1 ♂ and 2 ♀ from Njala, 17.iv.30, 4.iv.32, and a ♀ from Sembehun, 29.vi.26. All four specimens belong to the fully winged and tegminate phase of this species, which is well known to vary considerably in regard to the degree of development of these organs.

In addition to the above Carcinophorine the collection also includes a male *Euborellia* sp. in rather poor condition which it is not possible to determine exactly. This was taken at light at Shenge, 1.v.25, although it is flightless, its tegmina being reduced and the wings absent. It resembles *E. cincticollis* but has the pronotum less elongate and the parameres slenderer.

Three entirely apterous Carcinophorines, two of which, a female and an immature male, can only be referred to *Anisolabis sensu lat.*, are also included in the collection. They are from Njala, in Kola pod, 16.i.32, and Roboro, 18.ix.24. The third, a female from Shenge (at light, 1.v.25) may be the female of *Euborellia incisa* (Borelli), a male of which has recently been added to the writer's collection from Freetown, Sierra Leone, through the kindness of Dr. W. Peters.

Labidurinae.

Nala caprae Menozzi.

Nala caprae Menozzi, 1929, *Mem. Soc. ent. Ital.* **8** : 9 (French Guinea).

This species was described from French Guinea and is now recorded from Sierra Leone for the first time. The present collection includes 6 ♂, 13 ♀ and 2 damaged specimens from Njala (at light 19.iv.25, 21.v.26, x.26, 19.xi.26, at light 27.iv.27, at light 15.xi–8.xii.30, xi.31, 3.iv.32, 7.iv.32, 21.iv.32, light-trap 8–14.v.32, 23.v.32, vi.34) and Sumbuya (at light 28.xi.24).

A single wingless female (Njala, 7.iv.32) with abbreviate tegmina may represent a distinct species as the pronotum is shorter and truncate caudad, not broadly rounded as in *N. caprae*. This female cannot be determined without comparable male material.

Apachyinae.

Apachyus depressus (Palisot de Beauvois).

Forficula depressa Palisot de Beauvois, 1805, *Ins. Afr. Amer.* : 36, Orth. pl. 1, f. 5 (♂, Oware, Nigeria).

A series of 8 nymphs from Njala, taken under bark (20.vii.29), and all belonging to the same instar (? fourth), appear to be the present widely distributed species. It is unrecorded from Sierra Leone.

Brachylabinae.

In 1911 (*Genera Insectorum* **122** : 40) Burr commenced his diagnosis of this subfamily with the words " The family (sic !) is characterized by the total absence of organs of flight . . ." After dividing the genera into two sections by the size and position of the eyes he proceeded to use characters based on the presence or absence of rudimentary tegmina, the carinate or simple mesonotum, and the proportions of the proximal antennal segments, as a means of defining the eight genera which he included. For some time the unsatisfactory nature of this classification has been apparent to the writer, who has received for study a few specimens of several Madagascan species which do not conform to any

of the genera characterized by Burr on the basis of the above characters. The discovery of forty specimens of which no less than 38 are fully winged, in the present collection, completes the confusion into which the classification of the subfamily has fallen by the utilization of features which owe their existence to a condition of brachyptery in the material examined. The existence of fully winged Brachylabines emphasizes the futility of using characters based on the degree of development of the organs of flight, even for specific differentiation. These characters are evidently unstable even in groups which have been apparently firmly established as flightless as was the case in the present subfamily.

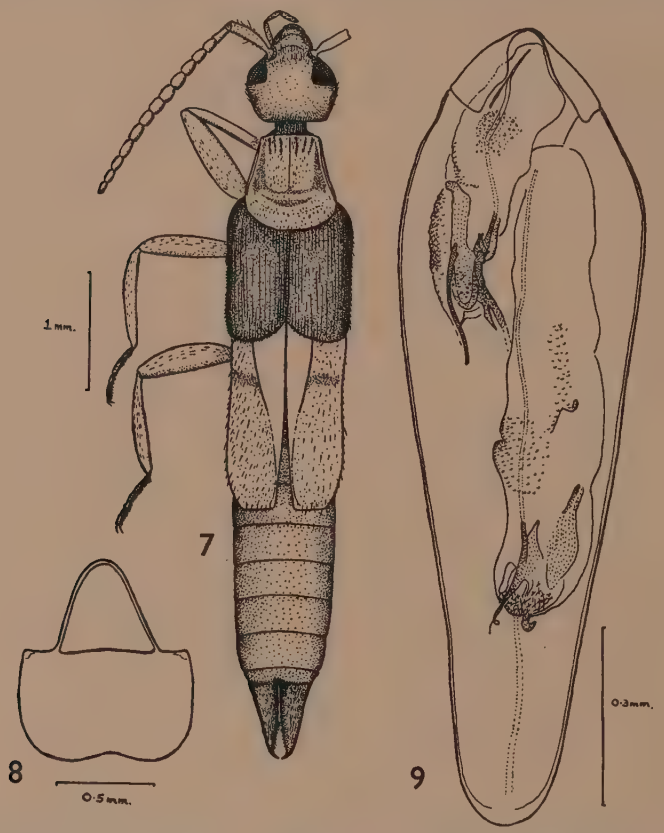
The genus *Geracodes* was established by Hebard in 1917 (*Trans. Amer. ent. Soc.* **43** : 322) for *G. litus* Hebard, 1917, from Panama, based on a single female specimen. It was placed by its author in the family LABIIDAE on account of the superficial resemblance to the genus *Labia*, and especially to *Labia minor* (L.). The present species from Sierra Leone clearly belongs to this hitherto neotropical genus, a second supposed species of which, *G. paraguayensis*, was described by Borelli in 1932 (*Konowia* **11** : 95). The extraordinarily close resemblance between *G. litus* and *G. labioides* is remarkable ; in the absence of data regarding the male of the former it is difficult to indicate the differences between the two species. The discontinuity in the distribution of *Geracodes*, which I am now transferring from the LABIIDAE to the LABIDURIDAE-BRACHYLABINAE, is a remarkable but well known feature of most of the genera of the present subfamily.

Hitherto most Brachylabines have been represented in collections by single specimens or by very few individuals, and the large series collected by Mr. E. Hargreaves underlines the great value of collecting earwigs with light-traps in the tropics.

Geracodes labioides sp. n. (figs. 7–9).

Colour of both sexes brown, varying in intensity in different individuals, but generally light with the head, and to a lesser extent, the pronotum, sides of tegmina and abdomen, darker. Coloration very similar to that of *Labia minor* (L.), which the present species superficially resembles in general appearance and which occurred with it at Njala. *Head* widest across eyes, strongly contracted in front and behind ; surface convex, dull, finely reticulate with decumbent pubescence ; caudal angles broadly rounded ; caudal margin almost truncate. *Antennae* stout, of 15 or 16 segments ; first segment long, as long as second to fourth together and slightly broader ; third half as long again as fourth ; fourth about one and a half times longer than broad ; from fifth onward subequal in length but increasing slightly in width as far as eighth, then decreasing gradually in width to apex. *Pronotum* cephalad no wider than caudal margin of head, strongly expanded caudad ; sides oblique ; caudal margin and caudo-lateral angles rounded ; surface finely reticulate with abundant sub-decumbent pubescence ; median sulcus clearly marked, incomplete caudad ; prozona tumid cephalad with three short grooves on either side of median sulcus ; metazona sharply depressed below level of prozona and coincident with lateral grooves, which are deeply impressed on inner side of the slightly reflexed lateral margins ; caudal extremity of the pronotum deflexed to adjust it to the base of the tegmina, beyond which it extends rather more than is usual. *Tegmina* complete, or slightly abbreviate in flightless individuals, about one and a half to two times as long as pronotum, to which they are similar in sculpture and vestiture, considerably broader than base of pronotum ; humeral angles rounded ; sides parallel ; caudal margin slightly obliquely rounded. *Wing-scales* unusually long, up to about one and a half times as long as tegmina in fully-winged individuals ; entirely absent in 5 per cent. of the material examined ; scales ample, together as broad as abdomen and hiding much of the latter, especially in the females

giving them the general appearance of Coleoptera ; inner portion of scale consisting of a long triangular fold of opaque membrane ; outer portion chitinized and resembling tegmina in texture and sculpture. *Abdomen* cylindrical, moderately polished, finely punctured with adpressed pubescence ; sides of segments simple, not differentiated in any way ; ultimate tergite transverse, sinuate distad with shallow median concavity ; pygidium hidden. *Forceps* simple, cylindrical, markedly pubescent, tapering to finely pointed, slightly curved distal extremity ; inner margin with a fine, minutely crenulate ridge. *Penultimate sternite* of male (fig. 8) transverse, slightly sinuate distad with sub-tuberculate



FIGS. 7–9.—*Geracodes labioides* sp. n. (7) Male. (8) Penultimate sternite and manubrium. (9) Genitalia.

elevation directly above ; of female transverse, distal margin simply convex. *Manubrium* of male large (fig. 8). *Legs* moderately long ; femora fairly robust, especially of the anterior pair ; tarsi very long, as long as tibiae ; metatarsus as long as second and third segments combined ; claws simple ; arolium absent. *Genitalia* (fig. 9) with parameres very small, acuminate distad ; penis lobes with extensive areas of small teeth ; virga apparently long, straight, with a complicated series of chitinous plates and rods.

Length (total) : ♂♀, 5–7 mm.

Types : Holotype ♂ Njala, xi.1931 (*E. Hargreaves*), Allotype ♀ same date (both in coll. B.M.). Paratypes : 1 ♂, Njala, 15.xi–8.xii.1930 (at light) (B.M.), 1 ♂ same data (coll. Hincks), 10 ♀ same data, and xi.31, 8–14.v.32 (light-trap),

30.x.32 (B.M.), 4 ♀, Njala, 15.xi–8.xii.30 (at light), 21.xi.28 (coll. Hincks). *Other material:* 20 ♀, Njala, x.26, 23.x.30, 1.xi.30, 15.xi–8.xii.30 (at light), 8–14.v.32 (light-trap), 30.x.32, 14.xii.32, 27.x.33; 2 ♀, Sama, 20.v.25 (B.M.).

Except for a colour range from light to dark brown, the above series shows very little variation. Two females have the wings apparently entirely absent and the tegmina slightly abbreviated. In these specimens, because of the absence of underlying flight wings, the tegmina are distinctly flattened on the dorsum. The absence of wings also exposes a marked emargination of the fourth tergite adjacent to the lateral glands.

G. labioides closely resembles the type species, *G. litus*, described from a single female from Panama. The discovery of males of the latter will probably reveal greater differences than appear to exist between the females. The head of *G. labioides*, viewed from above, has the sides distinctly converging caudad and the eyes appear to be larger than those of *G. litus*.

Labiidae.

Spongovostox assiniensis (Bormans).

Spongiphora assiniensis Bormans, 1893, *in* Bolivar, *Ann. Soc. ent. Fr.* **42**: 170 (♀, Ivory Coast).

This is a widely distributed and often abundant species which appears to be more extensively dispersed in West than in East Africa. It does not appear to have been recorded previously from Sierra Leone.

In the present collection there are 2 ♂, 4 ♀ from Njala (x.26, 17.iv.30, 24.x.30, 29.x.30) and Falaba (6–9.ii.25).

Spongovostox gestroi (Burr).

Spongiphora gestroi Burr, 1909, *Ann. Mag. nat. Hist.* (8) **4**: 122 (♂♀, Belgian Congo: Ibambo).

There are records of this species from Portuguese and French Guinea and Belgian Congo, but it has not been noted from Sierra Leone previously.

A pair from Njala (1.iv.27, ix.29) have been compared with Burr's series now in the British Museum (Nat. Hist.).

A third species of *Spongovostox* is represented in the collection by 3 ♀ (Njala, vii.28, 29.xi.30, 7.i.33) which cannot be identified with certainty in the absence of male specimens.

Chaetospania paederina (Gerstaecker).

Forficula paederina Gerstaecker, 1883, *Mitt. naturw. Ver. Greifswald.* **14**: 46 (♀, Gold Coast: Aburi).

There is no previous record of this West African species having occurred in Sierra Leone. A single male in the present collection is from Njala (dead tree, 4.i.33).

Labia minor (Linnaeus).

Forficula minor Linnaeus, 1758, *Syst. Nat.* ed. X: 423 (Europe).

This cosmopolitan species is well known from many localities in Africa, but does not appear to have been noted previously from Sierra Leone. It is an abundant European species and is well known to take to the wing readily.

The 37 specimens in the present collection include a number taken at light, together with *Geracodes labioides* sp.n., which they resemble superficially in size, build and coloration.

The present series was taken at Njala (various dates), Sembehun (a male at light 11.v.25), Sama (a broken specimen 20.v.25) and Bumpe (a male 20.vii.24).

Prolabia arachidis (Yersin).

Forficula arachidis Yersin, 1860, *Ann. Soc. ent. Fr.* (3) **8**: 509, pl. x, f. 30–35 (France: Marseilles, introduced).

A single female from Njala (11.xi.30) appears to be the first Sierra Leone record of this abundant cosmopolitan species.

CHELISOCHIDAE.

Euenkrates variegatum (Kirby, W. F.).

Sphingolabis variegata Kirby, 1891, *J. Linn. Soc.* (*Zool.*) **23**: 526 (♀, Sierra Leone).

Originally described from Sierra Leone, this West African species is now known to be widely distributed in the Western Forest Province. Six males and five females are included in the collection from Njala (x.35, from oil palm ♂ inflorescence, 10 specimens; 1 ♀, Njala, 11.xii.27).

FORFICULIDAE.

Thalperus kuhlgatzi (Burr).

Hypurgus kuhlgatzi Burr, 1909, *Ann. Mag. nat. Hist.* (8) **4**: 116 (♂♀, Togo: Bismarkburg).

A single male from Njala (7.iv.32) is the first record of this species from Sierra Leone. It has been noted from the Ivory Coast, Togo, Cameroons, and Belgian Congo.

Diaperasticus erythrocephalus (Olivier).

Forficula erythrocephala Olivier, 1791, *Encycl. méth. Ins.* **6**: 468 (♀, Cape of Good Hope).

This is the most widely distributed and generally abundant African earwig yet it appears to have escaped record from Sierra Leone. Seven males and six females are included in the present collection, all from Njala (various dates, at light and in guinea corn).

SUMMARY.

Very few records of Sierra Leone Dermaptera have been published. Eighteen species are noted above based on a collection made by Mr. E. Hargreaves. No less than 13 species have not been recorded previously from Sierra Leone. Two new species are described and figured, *Diplatys rotundicollis*, and a remarkable fully-winged Brachylabine, *Geracodes labioides*.

SIX NEW DECTICINAE (ORTHOPTERA, TETTIGONIIDAE) FROM TURKEY.[1]

By Dr. T. Karabag, F.R.E.S.

Paradrymadusa aksirayi sp. n. (figs. 1–4).

♂ (type). Of medium size. General coloration probably light reddish brown (specimens preserved in alcohol); head (except a black stripe on the forehead between eyes) and pronotum lighter.

Pronotum relatively wide, its hind edge black. Elytra extend to the middle of the fourth tergite, reddish brown. Cercus (fig. 1) subcylindrical, with a large strongly curved tooth before the apex, which is obtusely rounded. Titillator (fig. 2) long, slender, its serrate part narrow, with sparse teeth. Subgenital plate (fig. 3) wider than long, with a shallow rounded excision.

♀. General coloration darker than in ♂; occiput, pronotum, elytra dark reddish brown; sternites lighter.

Elytra extend to the end of first tergite, reddish brown. Subgenital plate (fig. 4) wider than long. Ovipositor longer than hind femur, slightly decurved.

	P. aksirayi sp. n.		*P. sordida* Herman.	
	♂	♀	♂	♀
Length of body . .	19·3–20·6 (type)	21·7–23·5	27·7–29·5	28·5–32·3
„ pronotum . .	6·2– 7·3 „	7·0– 7·3	6·4– 8·8	7·7– 7·8
„ elytra . .	6·8– 7·3 „	3·4– 3·9	5·9– 6·5	2·1– 2·4
„ hind femur .	14·1–15·9 „	17·0–17·1	21·3–23·8	24·6–25·0
„ hind tibia . .	14·3–16·0 „	16·2–17·0	21·4–24·0	25·1–25·5
„ ovipositor . .	—	18·9–20·0	—	18·4–18·7

Erzurum Province: Büyük Güney dağı, 3000 m., 16.viii.1948, 3 ♂, 4 ♀ (*F. Aksiray*).

Named in honour of Dr. Fethi Akşiray, who discovered it.

This species is related to *P. sordida* Herman, but differs from it by the length of hind femur and hind tibia in both sexes, male cercus, titillator and subgenital plate, as can be seen by comparing figs. 1–4 with figs. 5–8. The latter figures are drawn from specimens of *P. sordida* in British Museum collection, which are from Lori, Achtala (Armenia), and Tiflis.

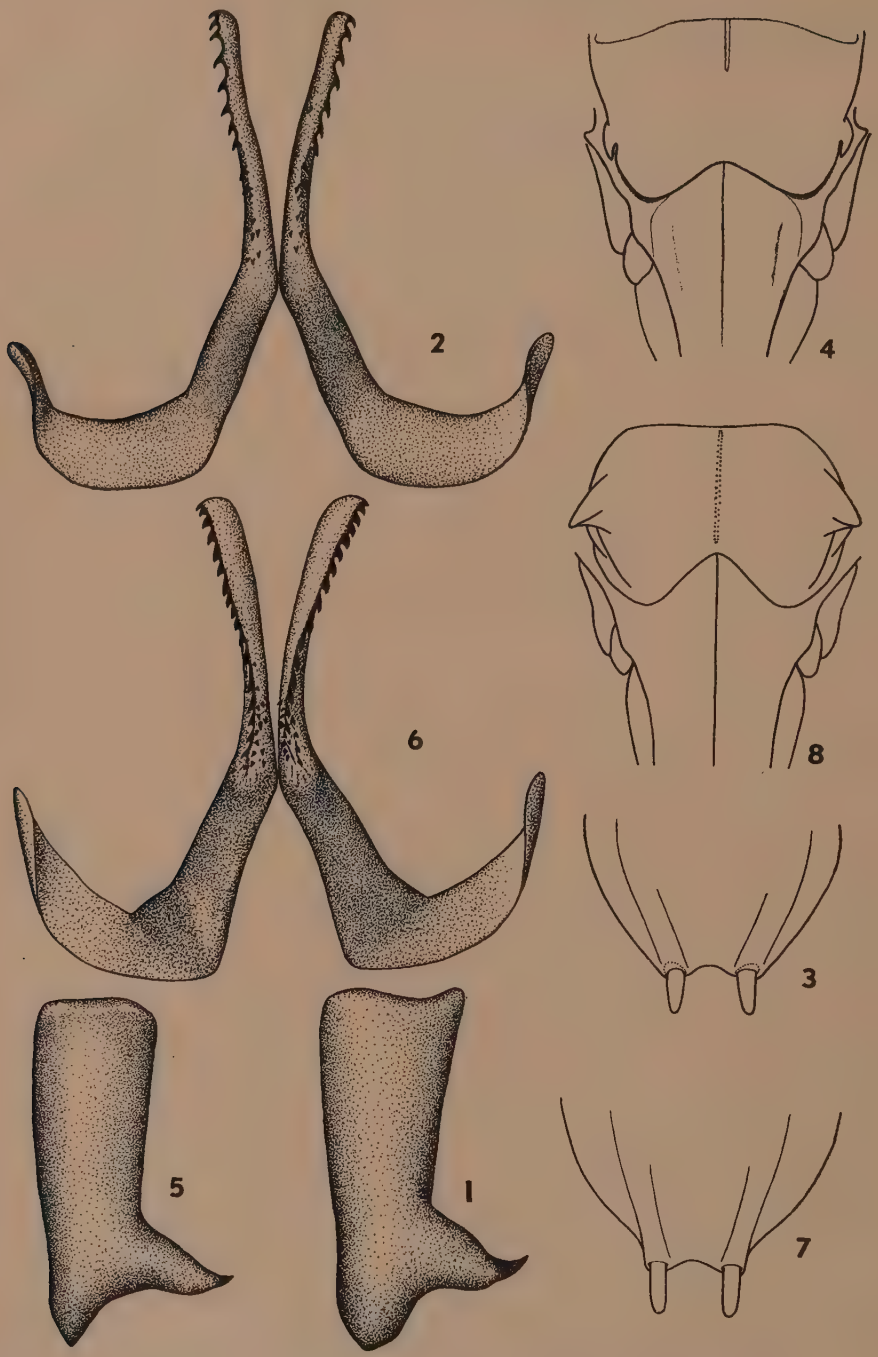
Psorodonotus anatolicus sp. n. (figs. 9–13).

♂ (type). A large species. General coloration dark brown, head and elytra lighter, sternum and under-surface of abdomen yellow. The following parts are black: meso- and metanotum, sides of abdomen, outer face of anterior femur and upper edge of tibia, interior surface of median femur, both faces of hind femur (except upper and lower edge) and sides of base of hind tibia.

Pronotum relatively long, slender, rough above, prozona narrowed; lateral pronotal lobe with a yellow stripe; between this stripe and the lateral carina there is an elongated black spot; lateral edges of the 7th, 8th, 9th and the last tergite yellow. Elytra reach the end of second tergite.

Last tergite rounded. Cercus (fig. 9) longer than half the length of the pronotum, extending beyond the subgenital plate, slender, slightly incurved, and in profile (fig. 10) upcurved, with a broad acute tooth near base. Titillator (fig. 11) large, with wide and massive basal pieces, its arms parallel, wide, with strong irregular teeth and irregularly expanded dentate apices. Subgenital plate (fig. 12) wide, with a shallow acutangular excision, yellow, with purple lateral stripes.

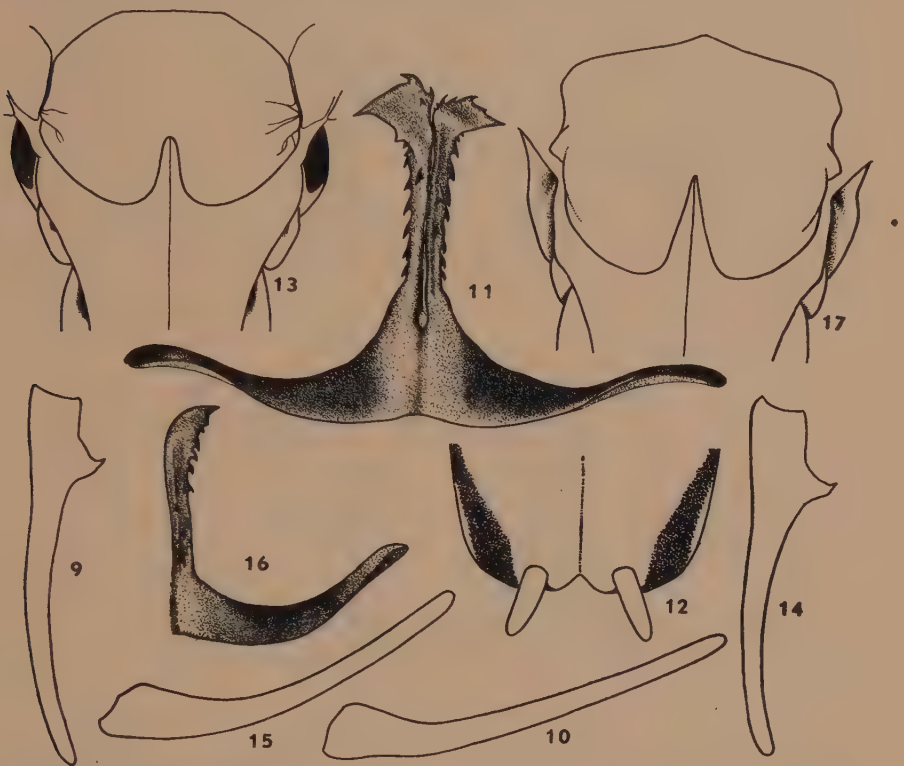
[1] The types of all species are deposited in the British Museum (Natural History); paratypes are in the Zoological Institute, University of Ankara.



FIGS. 1–8.—*Paradrymadusa aksirayi* sp. n. (1) ♂, left cercus; (2) ♂, titillator; (3) ♂, subgenital plate; (4) ♀, subgenital plate and base of ovipositor. *P. sordida* Herm. (5) ♂, left cercus; (6) ♂, titillator; (7) ♂, subgenital plate; (8) ♀, subgenital plate and base of ovipositor.

♀. Colour as in ♂. On the lateral edge of the anal segment a black spot ; upper ridge, near the base of ovipositor, black.

Elytra small, hardly visible laterally. Subgenital plate (fig. 13) rounded, wider than long, with a deep and narrow rounded excision and broadly rounded lobes. Ovipositor wide and very strong, longer than hind femur, slightly upcurved, dirty yellow, apically dark brown.



FIGS. 9–17.—*Psorodonotus anatolicus* sp. n. (9) ♂, left cercus ; (10) ♂, left cercus in profile ; (11) ♂, titillator ; (12) ♂, subgenital plate ; (13) ♀, subgenital plate and base of ovipositor. *P. caucasicus* F. W. (14) ♂, left cercus ; (15) ♂, left cercus in profile ; (16) ♂, right half part of titillator ; (17) ♀, subgenital plate and base of ovipositor.

	P. anatolicus sp. n.		*P. caucasicus* F. W.	
	♂	♀	♂	♀
Length of body	30·8–36·2 (type)	32·3–37·2	34·7	40·0
„ pronotum	12·2–12·7 „	12·0–14·0	14·4–	14·1
„ elytra	9·2– 9·5 „	—	9·0	—
„ hind femur	20·8–22·3 „	23·7–24·4	22·6	26·1
„ hind tibia	19·3–20·8 „	21·1–21·9	19·5	23·3
„ cercus	7·4– 7·5 „	—	7·6	—
„ ovipositor	—	25·4–27·1	—	27·0

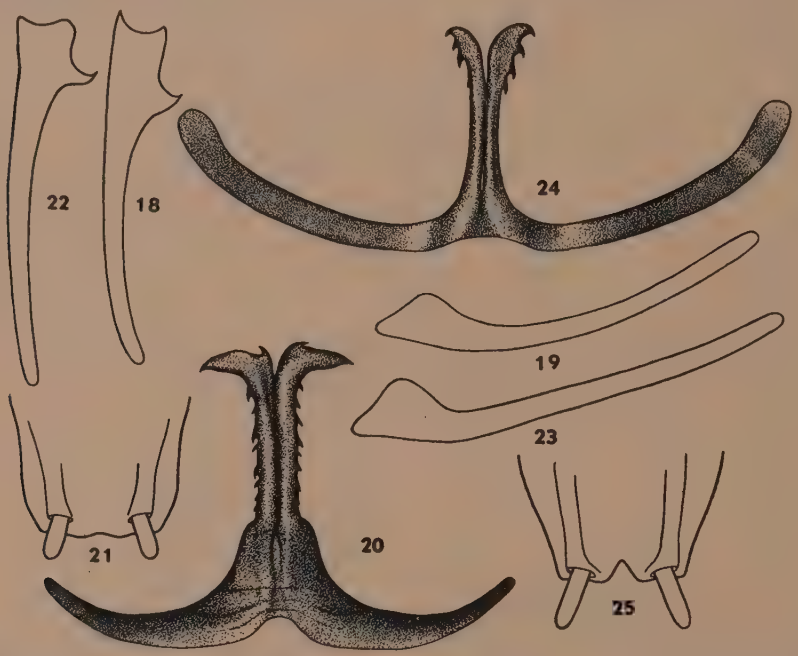
MANISA PROVINCE : Gördes, Kalemoğlu köyü, 9.vi.1950, 3 ♂, 3 ♀ (Izmir Plant Protection Station).

This species is related to *P. caucasicus* F. W. (= *uvarovi* Ebner), but differs from it by colour and by the male cercus, titillator and female subgenital plate, as can be seen by comparing figs. 9–13 with figs. 14–17, which are drawn from

specimens of *P. caucasicus* F. W. from Eastern Transcaucasia, in the British Museum collection.

Psorodonotus ebneri sp. n. (figs. 18–21).

♂ (type). Of medium size. General coloration dirty light brownish, head dirty green, elytra yellow, hind femur of one colour.



Figs. 18–25.—*Psorodonotus ebneri* sp. n. ♂ (18) left cercus; (19) left cercus in profile; (20) titillator; (21) subgenital plate. *P. fieberi* Friv. ♂ (22) left cercus; (23) left cercus in profile; (24) titillator; (25) subgenital plate.

Pronotum relatively long and narrow, above very feebly rugulose. Elytra extend to the end of third tergite. End of last tergite rounded. Cercus (fig. 18) long and slender, slightly incurved, in profile (fig. 19) regularly upcurved with a strong and thick tooth near the base. Titillator (fig. 20) light castaneous in colour, darker and shining on the anterior surface, basal pieces relatively short, very broad at base, narrowing apically, arms strong, stout, their apices expanded sideways, very acute and with a tooth at the base of the expansion, stems with many acute teeth. Subgenital plate (fig. 21) with a very shallow rounded emargination.

	P. ebneri sp. n. ♂	*P. fieberi* Friv. ♀
Length of body	29·2 (type)–31·5	27·2–33·2
„ pronotum	12·4 „ –13·2	11·8–13·6
„ hind femur	20·8–21·5 (type)	20·7–21·4
„ cercus	7·0 type	8·1 mm.

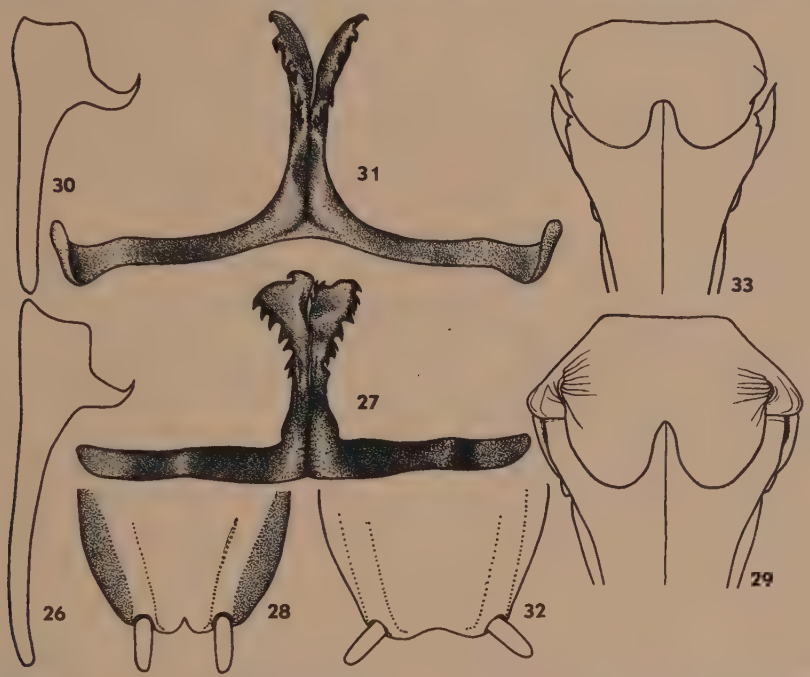
Antalya province: Tahtali dağ, 1500 m., 11.vii.1949, 1 ♂ (type) (*K. Bilger*); Çalbali dağ, 1800 m., 14.vii.1949, 2 ♂ (*P. H. Davis*).

The species is dedicated to Professor Richard Ebner, outstanding expert in Orthoptera, who has revised the genus *Psorodonotus*. It is allied to *P. fieberi*

(Frivaldsky), but differs by the tooth of the male cercus, the cercus in profile, titillator and subgenital plate, as can be seen by comparing figs. 18–21 with figs. 22–25. Figures of *P. fieberi* are drawn from specimens in the British Museum collection, which are from Macedonia, Bistra Mt., nr. Albanian Border.

Psorodonotus rugulosus sp. n. (figs. 26–29).

♂ (type). Of medium size. Coloration probably dark castaneous (specimens preserved in alcohol); face lighter; two parallel black stripes along the middle of the occiput and one large black stripe on each side of the occiput, behind eyes a small black stripe; elytra light; black streaks and spots on the anterior, intermediate and hind femora; a large black spot on the inside of hind femur and a large black spot on intermediate and hind coxa.



Figs. 26–33.—*Psorodonotus rugulosus* sp. n. (26) ♂, left cercus; (27) ♂, titillator; (28) ♂, subgenital plate; (29) ♀, subgenital plate and base of ovipositor. *P. venosus* F. W. (30) ♂, left cercus; (31) ♂, titillator; (32) ♂, subgenital plate; (33) ♀, subgenital plate and base of ovipositor.

Pronotum with approximately parallel lateral carinae, its surface above rough, with the median carina visible only in the metazona. Elytra extend to the end of third tergite. Last tergite rounded. Cercus (fig. 26) approximately as long as anterior femur, incurved, with a long and strong tooth near the base. Titillator (fig. 27) relatively small, its arms short, wide, flat, irregularly expanded to the apex and with strong teeth, its basal branches practically straight, of equal width throughout. Subgenital plate (fig. 28) with a narrow acutangular excision, with black lateral stripes.

♀. Colour as in ♂, but the black median stripe of the occiput not divided by a light line; pronotum lighter.

Only a very small part of elytra visible. Subgenital plate (fig. 29) wider than long, with a deep subacute excision. Ovipositor approximately twice as long as pronotum, slender, slightly upcurved, the lower surface and the apical portion brown.

	P. rugulosus sp. n.		*P. venosus* F. W.	
	♂	♀	♂	♀
Length of body . .	24·8–26·4 (type)	31·8–32·7	26·1–30·3	29·6–33·8
„ pronotum . .	11·5 (type)–11·7	11·0–11·4	12·3–13·7	11·9–13·6
„ elytra . .	7·3 „ 8·1	—	11·3–12·1	—
„ anterior femur .	4·1– 4·5 (type)	4·2– 4·5	4·4– 4·6	4·5– 4·8
„ anterior tibia .	4·8– 5·1 „	5·1	5·2– 5·7	5·3– 5·9
„ hind femur .	15·8–17 „	18·0–18·4	18·8–19·6	19·6–21·0
„ hind tibia . .	14·0–14·7 „	15·7	15·4–16·9	17·1–19·0
„ cercus . .	4·7– 4·8 „	—	3·3– 3·8	—
„ ovipositor .	—	21·5–22·1	—	22·2–23·9

ERZURUM PROVINCE : Büyük Güney dağı, 26.viii.1948, 4 ♂, 2 ♀ (*F. Aksiray*).

This species is related to *P. venosus* F. W., but differs from it by colour, by the pronotum being shorter, with the metazona not wider than prozona and the median carina visible only in prozona, by the cercus, titillator, subgenital plate of the male, and by the female subgenital plate (compare figs. 26–29 with figs. 30–33). Figures of *P. venosus* F. W. are drawn from specimens in the British Museum collection, which are from Darachichag (Caucasus, Armenia).

Pholidoptera excisa sp. n. (figs. 34–35).

♀ (type). A small species. Coloration castaneous, with black markings as follows : spectacle-like pattern on the face (fig. 34), first antennal segments, edge of fastigium, a stripe behind the eye, a stripe on each side of occiput, lateral pronotal lobes except a broad dirty yellow lower margin, first abdominal tergite, apical part of last tergite, second valvifer, sides of ovipositor, streaks and spots on the anterior and median femora and tibiae, a large spot above near base and on both sides of middle portion and apex of hind femur, base of hind tibia.

Subgenital plate (fig. 35) very broadly excised with narrow lateral lobes, slightly convex, basal part black ; 7th sternite slightly convex, near base with a transverse convexity which in the middle extends to the 6th sternite ; a parabolic convexity occupies most of the rest of the plate. Ovipositor a little shorter than hind femur, straight, very weakly upcurved.

Length of body 17·5 ; pronotum 8·9 ; hind femur 20·2, ovipositor 18 mm.

ADANA PROVINCE : Bahçe, Dildil dağı, 1600–2000 m., 27.viii.1949, 1 ♀ (*P. H. Davis*).

This species is quite unique in the structure of the female subgenital plate.

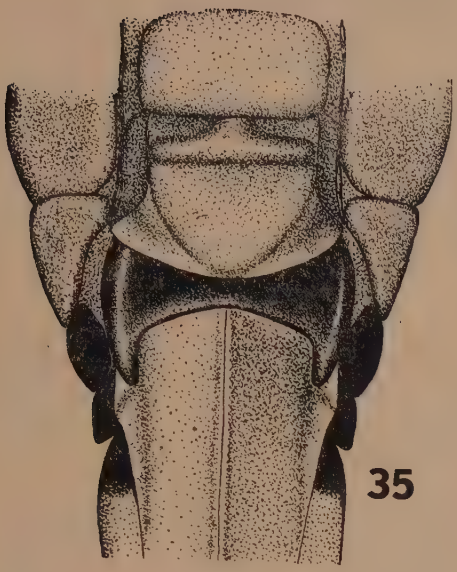
Pholidoptera grandis sp. n. (figs. 36–42).

♂ (type). The largest known species of the genus. General coloration brown, face lighter ; the following parts are black : antennal sockets, edges and middle of fastigium, stripe above and behind the eyes, posterior edge of the occiput, lateral lobes except a broad, yellow lower margin, middle part to the posterior edge of the elytra, a large spot on both sides of the first tergite, an upper basal spot on anterior femur, streaks on the median femur, a large and long spot on the outer and inner sides of hind femur.

Pronotum relatively long. Elytra short, extend to the end of the first tergite, mostly covered by pronotum. Last tergite light coloured, with a deep rounded excision (fig. 36),

FIGS. 34–35.—*Pholidoptera excisa* sp. n. (34) ♀, face ; (35) ♀, seventh sternite, subgenital plate and base of ovipositor.

FIGS. 36–42.—*Pholidoptera grandis* sp. n. (36) ♂, end of last tergite ; (37) ♂, left cercus ; (38) ♂, titillator ; (39) ♂, titillator in profile ; (40) ♂, subgenital plate ; (41) ♀, subgenital plate and base of ovipositor ; (42) ♀, subgenital plate and base of ovipositor in profile.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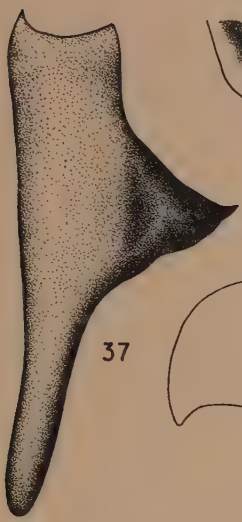
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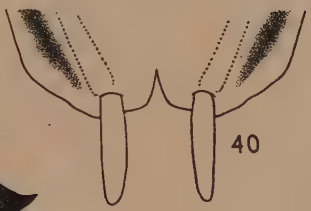
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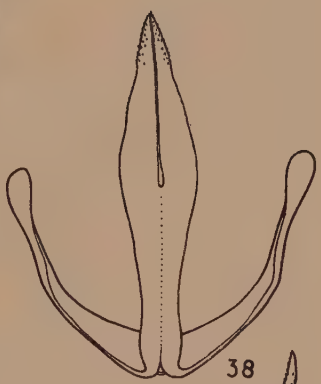
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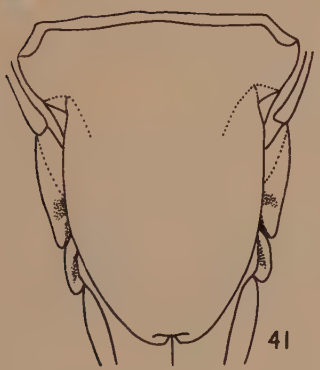
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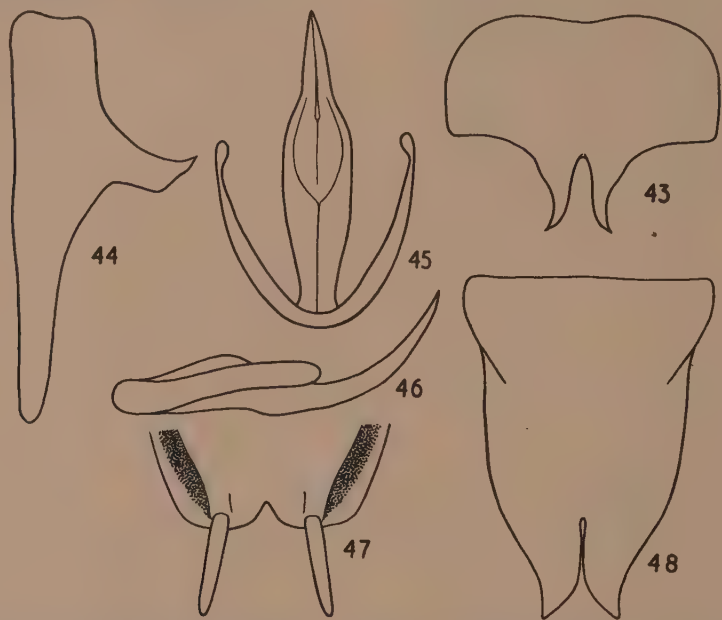
and with narrow, straight pointed lobes, which are dark coloured. Cercus (fig. 37) relatively long and very stout, slightly outcurved, with a strong and broad black tooth inside before the middle. Titillator (fig. 38) large and strong, its basal branches recurved; its stem near the base expanded in profile (fig. 39), apical arms shorter than the stem, with small spines near apex. Subgenital plate (fig. 40) large, longer than wide, with an acutangular excision, yellowish with a black lateral stripe.

♀. Colour as in ♂. A very small part of elytra visible laterally. Subgenital plate (fig. 41) very large, approximately half the length of pronotum, and strongly convex (fig. 42), basal part wider. Ovipositor almost straight, approximately as long as hind femur, its upper edge near the base black.



FIGS. 43–48.—*Pholidoptera indistincta* Bol. (43) ♂, end of last tergite; (44) ♂, left cercus; (45) ♂, titillator; (46) ♂, titillator in profile; (47) ♂, subgenital plate; (48) ♀, subgenital plate.

	Ph. grandis sp. n.		*Ph. indistincta* Bol.	
	♂	♀	♂	♀
Length of body . . .	30·3–34·5 (type)	34·3–38·4	27·6	30·9
„ pronotum . . .	11·3–12·8 „	12·0–13·0	10·4	11·5
„ elytra . . .	1 (visible part) (type)	—	—	—
„ hind femur . .	27·3–28·4 (type)	30·2–31·3	25·7	30·8
„ ovipositor . .	—	28·2–30·2	—	27·7
„ subgenital plate .	—	6·1	—	6·7 mm.

ANTALYA PROVINCE: Akseki, 26.vii.1943, 3 ♂ (type), 2 ♀ (Central Institute for Plant Protection, Ankara); Gbiz-Bozburun dağı, 1700 m., 27.vii.1949, 1 ♂, 4 ♀ (*P. H. Davis*).

This species is allied to *Ph. indistincta* Bolivar, but differs from it by the length of body, last tergite, cercus and titillator of male, and by the female subgenital plate (compare figs. 36–42 with figs. 43–48). Figures of *Ph. indistincta* are drawn from a cotype in the British Museum collection, which is from Yenidje (S. Turkey, Marash province).

SYRPHUS MALINELLUS SP. N. (DIPTERA, SYRPHIDAE).

By J. E. Collin, F.R.E.S.

The generic name *Syrphus* is here retained in the sense in which it has been used since 1844 when Rondani designated *Musca ribesii* L. as its type. Its use in place of *Leucozona* Schin., as has been suggested, would be directly contrary to the instructions issued by the Zoological Congress in 1913 when allowing suspension of the Rules of Nomenclature *especially for such cases*. In connection with this and similar cases it should be noted that the Congress at its recent Paris meeting, by indicating very clearly their support for continuity in the use of well-known names, implicitly endorsed not only these instructions, but also the principle embodied in Opinion 107 " that a name in current use is not to be supplanted by an earlier but rarely adopted or an unadopted name unless the argument is unambiguous, and unless the premises are not subject to differences of opinion."

The species of *Syrphus* now described is one of those possessing a certain (presumably primitive) character in the presence of hairs on the anterior depressed portion of the mesopleura immediately behind the prothoracic spiracle—a character requiring careful examination because hairs curving over from adjacent areas may appear to arise from the depression. The other British species possessing this character are : *balteatus* Deg., *auricollis* Mg. (and its *vars.*), *cinctellus* Zett., *punctulatus* Verr., *vittiger* Zett., *annulatus* Zett., *lineola* Zett., and *nigritarsis* Zett. The first three of these species possess a second primitive character in the presence on actual hind margin of wing of a series of minute strips of dark chitin placed alternately on upper- and underside of wing surface, but another species (*cinctus* Fln.) which possesses this second character is without the first, a fact which depreciates the value of either as a group character. Indeed, one finds throughout the whole genus combinations of characters so varied and numerous that it is doubtful whether any reasonably sound subdivisions are possible.

The *S. nigritarsis* Zett. mentioned above was recorded by Verrall as British on specimens which he subsequently correctly considered to be varieties of *latifasciatus*. However, females of the true *nigritarsis* (agreeing with the type male in Zetterstedt's Collection) have been taken by Mr. C. J. Wainwright and myself at Grantown-on-Spey in Scotland, and I possess a Scandinavian pair given to me by my friend Mr. O. Ringdahl. The species is peculiar in having the scutellar pubescence yellow in the female but dark in the male.

Syrphus malinellus sp. n. ♂ ♀.

In size and general appearance very much like *vittiger* Zett., but thorax more distinctly shining. Male still more like *annulatus* Zett., but front tibiae and tarsi not entirely yellow.

♂. Compared with *vittiger*, face more obscurely yellowish with the median dark band wider and much less sharply defined, and *lower part of face on each side* (*including mouth edge and jowls*) *broadly darkened* with only a slight coating of whitish dust. Antennae yellowish on lower part of first two joints, and on lower part (at least about base) of third joint.

Thorax more brightly shining *black*, for though it has a universal coating of microscopic dust (more conspicuous on prescutellar area), this is not so dense nor so greyish-brown in colour as in *vittiger*. Pleurae also less densely dusted.

Abdomen with very similar yellow markings, each one narrowly drawn out (upwards) towards basal side corner of each tergite, and extending over sides. Ventral dark markings apparently larger, and some dark hairs on at least fourth sternite.

Legs *with femora more extensively darkened*, less than apical half of four anterior, and only tip of hind, femora yellow. Four anterior tibiae with an indistinctly margined dark ring towards tip ; hind tibiae more extensively darkened, and *all* tarsi more distinctly darkened. More numerous black bristly hairs on femora (especially four anterior), and some black hairs on middle and hind coxae. Wings slightly brownish with costal " stigma " well marked.

♀. Differing from *vittiger* in face and jowls as in male. Frons more like that of *punctulatus* ; dust patches narrower opposite lunule than in *vittiger* and practically meeting in an arc above.

Thorax viewed from above with a stripe on each side less dusted (the dust being greyer), and consequently more shining black than the broad, more brownish dusted, middle portion (certainly more shining than in *vittiger*), the notopleural area as usual densely dusted greyish. Pleurae less densely dusted than in *vittiger*.

Abdomen obviously differing from *punctulatus* in having *entire* transverse yellow bands on tergites 3 and 4, while all yellow markings are rather wider : those on second tergite for instance are at widest part wider than distance from hind margin of tergite ; in fact the abdomen is much more like that of *vittiger*, but bands extending more widely over sides. Hind margin of fourth tergite, and a transversely elongate patch at base on each side of fifth tergite, yellow. Hind margin of fifth tergite more narrowly yellow than in *vittiger* and its side margins not yellow.

Four anterior femora more extensively yellow than in *punctulatus* (about apical half yellow), but black hairs predominating on this yellow part more than in *vittiger*. Hind femora not yellow at base. Tibiae and tarsi similar to those of *punctulatus* ; hind tibiae and all tarsi not so extensively yellow as in *vittiger* or *annulatus*.

Length, 8–9 mm.

It is normally a larger species than *annulatus*, and the male in addition to the different leg coloration has each yellow marking on second abdominal tergite widest at about one-third from side margin ; in *annulatus* they are of more even width throughout. The male of *lineola* has darker antennae, still darker legs, and decidedly less shining thorax.

At one time I thought that the above species might be the true *S. vittiger* Zett., perhaps previously misidentified by us, but I have been able to examine Zetterstedt's type male (taken at " Lycksele "), which is a somewhat immature and rubbed specimen and consequently more bluish in colour, but not otherwise distinguishable from our British *vittiger*.

The male type of *S. malinellus* was taken on Crab-apple blossom near Crowborough (Sussex) on 18th May, 1932, and Mr. C. J. Wainwright, who was collecting with me at the same time, took two more males, while three years later (13th April, 1935) he caught an additional male at Holmsley (Hants). A specimen of what I believe to be the female was taken by Mr. Wainwright near Grantown-on-Spey (Scotland) on 20th June, 1942. I have also seen another female taken at the same place by Mr. R. L. Coe some time between the end of May and beginning of June, 1934, and two females from Switzerland submitted to me by Dr. F. Schneider of Wädenswil.

A DESCRIPTION OF THE HITHERTO UNKNOWN LARVA OF *THEOBALDIA INDICA* EDWARDS (DIPTERA, CULICIDAE), WITH A KEY TO LARVAE OF THE PAKISTAN SPECIES OF *THEOBALDIA* NEVEU-LEMAIRE, 1902.

By M. Qutubuddin, M.Sc.

(*Malaria Institute of Pakistan, Karachi.*)

The larva of *Theobaldia indica* Edwards differs from those of *Theobaldia longiareolata* (Macq.) and *T. niveitaeniata* (Theo.) in the branching of the frontal setae, number of pecten teeth, shape of mentum, number of its teeth and siphonal index.

Fig. 1.—(*a*) Head (appearance in crushed pelt); (*b*) seta "C"; (*c*) mentum.

Length of crushed pelt about 9 mm. including *siphon*, which is 1·4–1·5 mm. long; *head* (fig. 1 shows appearance in crushed pelts) pale brown, with areas of varying shades of infuscation on the fronto-clypeus and epicranium. *Antenna* dark brown, proximal one-third being paler, comparatively short, rather slender and nearly straight, length about 0·3–0·32 mm., shaft smooth. *Antennal tuft* with 3–4 branches, situated at about 0·6 from the base. Of the two *terminal bristles* the outer one is stout, shorter, with a blunt end, the inner one is almost twice as long, thinner and pointed. *Sub-terminal bristles* both long and thin, the inner one as long as the inner *terminal* bristle and the outer a little shorter. Median portion of *mouth brushes* consists of *comb-toothed hairs*. Bases of setae "A," "B" and "C" almost in a straight line. Base of seta "d" inside and anterior to

that of "C." Seta "A" with 4–5 branches with very fine inconspicuous fraying. Base of seta "B" almost equidistant from those of "A" and "C." "B" and "C" with 11–17 branches with fraying. "d" small and 2-branched. Mentum with 8–9 teeth on either side of the large central tooth (which is truncated in one of the specimens).

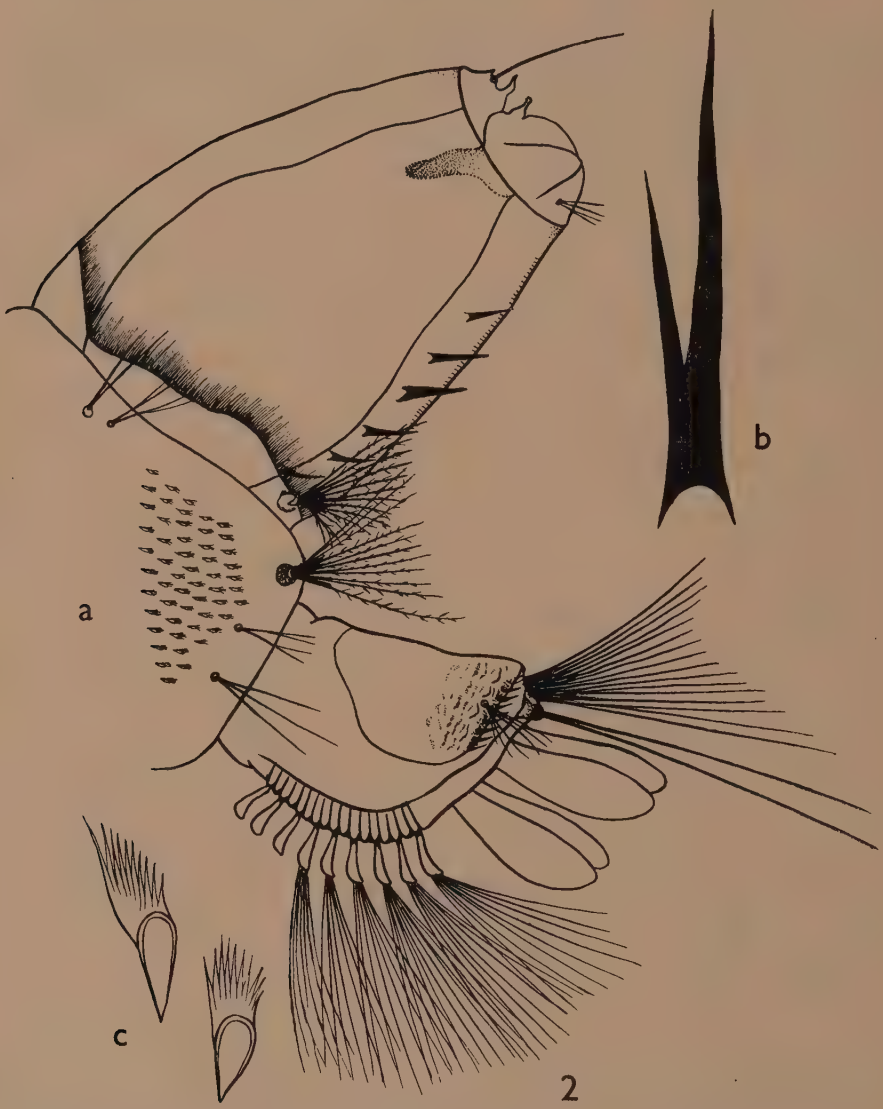


FIG. 2.—(*a*) Siphon (appearance in crushed pelt); (*b*) pecten spine; (*c*) comb scales.

Thorax: For describing the dorsal thoracic setae the chaetotaxy followed is that employed by Marshall (1938: 47).

Prothoracic setae: Seta *1* trifid, finely frayed, *2* single, frayed, *3* 4-branched, frayed, seta O heavily branched. *Mesothoracic setae:* Seta *1* 4–6 branched, *2* trifid or 4–branched, *3* single, 4–5 times as long as seta O, *4* trifid or 4-branched, *5* 8-branched, minutely barbed,

6–7 both single, strong bristles with fraying. *Metathoracic setae :* Seta *1* long, 4-branched, *2* long, 6–7 branched, *3* 13–16 branched, long and frayed, *4* short, 5-branched, *5* single, small, *6* single, very long. *Lateral tufted hairs* on thorax well developed, arising from large chitinized tubercles.

Abdomen : Lateral hairs on abdomen fairly long, especially on I–III that arise from chitinized bases. Segment VIII, "*pentad hairs*" (Marshall, *loc. cit.* : 49), α bifid, strong, frayed, branched almost at the base, beyond which in one specimen the shaft divides into 5 branches, β delicate, 4-branched, γ 9–11 sub-plumose branches, δ delicate, 4-branched, ε strong, trifid and of the form of a "trident." *Comb* of about 50–60 scale-like fringed teeth each with several sharp-pointed ends. *Siphon* (fig. 2 shows appearance in crushed pelts) : Chitinization at base towards posterior margin irregular in outline, acus absent ; pecten of about 5–7 fairly large widely spaced teeth (simple as well as with shorter denticles commencing from base), extending from base nearly to the apex ; a few smaller teeth near the base with 1–4 denticles. *Siphonal tuft* arising from a more or less circular cleft in the irregular posterior margin of the basal chitinization, stellate with 11–14 sub-plumose branches, and about one-fourth to one-third the length of the siphon. *Sub-siphonal tuft* (γ) large, with 9–11 subplumose branches. *Siphonal index* 1 : 5 in the crushed pelts. Siphonal valves large. *Anal segment* with a number of strong spines on posterior border of saddle. Lateral seta fine and 4–8 branched. Upper (inner) caudal seta divided into a number of branches subequal in length. Lower (outer) caudal seta very long and strong, arising from a more highly chitinized base, divides a little above the base into two equally long setae with additional 1–2 fine branches at the point of bifurcation. *Ventral brush* with 18 tufts. *Anal papillae* pointed, varying from as long as the saddle to three-fourths of its length.

The material used was liaison pelts of three females of *Theobaldia indica* Edwards reared from larvae collected in November, 1949, from foul-smelling water in an unused masonry well at Kachai village, Kohat District, N.W.F.P., Pakistan. Several adults were, later on, taken from the same place.

Key to Larvae of the Pakistan Species of Theobaldia.

1. Frontal setae " B " and " C " single ; acus absent . *longiareolata* Macquart.
2. Frontal setae " B " and " C " branched ; acus may be present . . . . 3.
3. Frontal setae " A," " B " and " C " all equally developed, each with 3–10 branches ; mentum with 11 teeth on either side of the central tooth ; acus fairly large ; pecten with 12–16 teeth ; siphonal index about 3 ; siphonal tuft 8–10-branched ; lateral hair on the anal segment fine with 3–4 branches . . . . . *niveitaeniata* Theobald.

   Frontal setae " A," " B " and " C " not equally developed, " A " with 4–5 branches, " B " and " C " 11–17-branched ; mentum with 8–9 teeth on either side of the central tooth ; acus absent ; pecten with 5–7 teeth ; siphonal index about 1 : 5 ; siphonal tuft 11–14-branched ; lateral hair on the anal segment very short, fine, with 4–8 branches *indica* Edwards.

ACKNOWLEDGMENTS.

I take this opportunity to record my grateful thanks to Lt.-Col. M. Jafar, Director-General, Health Services, Pakistan, for the permission to publish this paper. I owe a deep debt of gratitude to Mr. P. F. Mattingly of the British Museum (Nat. Hist.) for kindly going through the manuscript and communicating this paper. I am also indebted to Major M. Z. Y. Husain, Officer-in-Charge, Malaria Institute of Pakistan, for the facilities afforded. To Mr. Bashir Ahmed, Malaria Inspector, my thanks are due for help in collection.

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Book Notices.

The Karanasa *Butterflies, A Study in Evolution.* By A. Avinoff and Walter R. Sweadner. 8vo. *Ann. Carnegie Mus.* **32** : 1–250, 17 pls., 1951. Limited edition (750 copies, 600 with col. pls.).

This is a posthumous publication, both authors having died before it appeared in print. It is a survey of the Asiatic butterflies of the genus *Karanasa* Moore, which is confined to the high mountain system centering on the Pamirs, and including parts of the Karakoram, the Hindu Kush, the Punjab Himalayas, the Alai-Tag and the Tian Shan.

The habitat is reviewed, followed by a full taxonomic study of the butterflies. As a start the seventy-seven subspecies are described, and are considered as " forms of the first category " ; these are then assembled into higher categories by four stages, the last (" fifth category ") corresponding generally to the species level. A systematic chart shows this classification graphically.

There are also general chapters on " Simultaneous Occurrence " and on " Coincident Variation and Intergradation," and a Summary. The plates show a large number of individual specimens in colour or in half-tone.

A Field Guide to the Butterflies of North America, East of the Great Plains. By Alexander B. Klots. 8vo. Boston (Houghton Mifflin Co.), 1951. Pp. xvi + 349, 247 col. figs., 232 half-tone. Price $3.75.

Part 1 (60 pp.) deals with general topics, including collecting and preserving ; the butterfly and its environment ; life histories and growth ; the adult butterfly ; and classification, with keys to families.

Part 2 deals with the butterflies by families, with general notes, followed by a particular account of each species : this includes larva, range, subspecies, and a note of similar species that may cause confusion. A good deal of information is condensed into a small space. The figures, both coloured and half-tone, are annotated, drawing attention to significant details of colour and pattern

There is a separate section on casual and stray species and false and dubious records, followed by appendices dealing with the principles of classification ; butterfly literature ; a check list ; and three indexes.

TWO NEW SPECIES OF AFRICAN *CERIAGRION* (ODONATA), THE TYPE OF *C. CORALLINUM* CAMPION, AND NOTES ON THE GENUS.

By Miss Cynthia Longfield, F.R.E.S.

In March and April, 1941, Lt.-Col. F. C. Fraser published two papers on African Odonata (*Proc. R. ent. Soc. Lond.* (B) **10** : 35–42 ; 61–66). In the first paper he comments on *C. corallinum* Campion and gives an illustration of what purports to be the anal appendages of the male. The second paper is devoted to an interesting account of the nine African species of the genus, including a description of three new ones, a key to the African species, and the illustrations of the male anal appendages of seven of them. Unfortunately, once again, the same insect has been drawn for *corallinum* Campion. I did not return to work on the Odonata until 1945, and even then I had no cause to question the accuracy of Fraser's illustrations. It was not until I was examining, in 1950, some *Ceriagrion* sent me by Mr. J. A. Whellan from Rhodesia that I discovered the mistake. The insect that Fraser has drawn is not Campion's *corallinum*, the type of which is in the British Museum (Natural History). I here illustrate the type male, by drawings done by Mr. D. E. Kimmins (fig. 1). There is no

Fig. 1.—*Ceriagrion corallinum* Campion : Male anal appendages from above, behind and laterally. (Type ♂, Sierra Leone.)

question of any distortion as there are three more males in the type collection, two of them labelled co-type. It is easy to see the marked difference in length of the superior anal appendages, from both the side and above. There are also slight differences in the shape and tooth of the inferior appendages and in the position of the latter when viewed from behind. There is a tiny tooth on the inner upper surface of the superior appendages which is not found on the new species described below. Fraser's attention was drawn to this error in identity and he found that he had made *camera lucida* sketches of the appendages of the three Campion types, *corallinum*, *citrinum* and *ignitum*, subsequently to the publication of his papers, and that his published drawings of *corallinum* were done from two mis-determined specimens taken at Uganda, Lake Victoria, in

1923 by Prof. G. D. Hale Carpenter. He tells me that an examination of these shows that the appendages agree with those of the two males described below and named *whellani* after the collector (fig. 2). It is to be presumed that the single male, determined by Fraser as *corallinum*, from Dr. R. Paulian's collection from the French Cameroons also belongs to *whellani*.

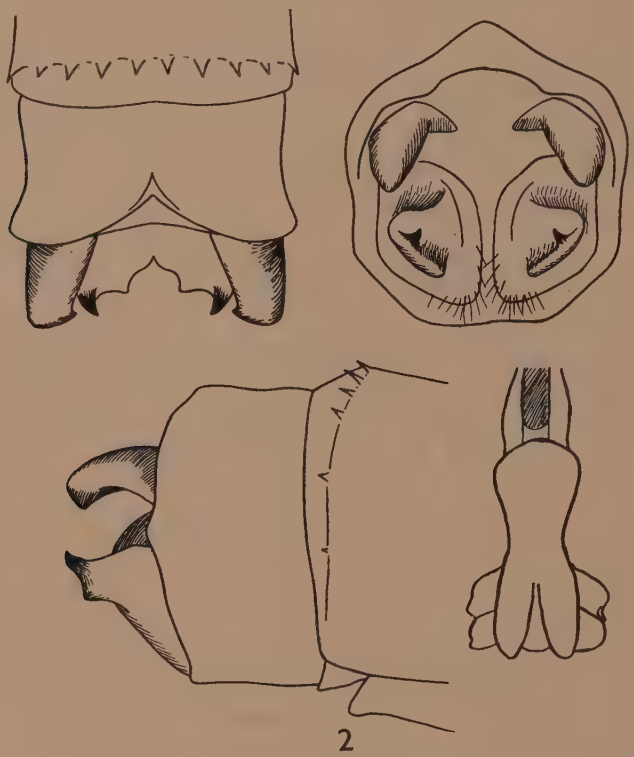


Fig. 2.—*Ceriagrion whellani* sp. n. Male anal appendages from above, behind and laterally. (Type ♂, S. Rhodesia.) Penis (paratype ♂).

Ceriagrion whellani sp. n.

Male holotype: abdomen 27·5 mm.; hind wing 17·5 mm. Head, legs and thorax green and yellow, abdomen scarlet and yellow.

Head: Labium and rear of head and eyes pale greenish-yellow. Base of mandibles, genae, labrum, clypeus and anterior portion of frons to ridge, citron-yellow. A black spot on either side of base of labrum, in suture. Eyes above, vertex and epicranium grass-green with rust in the depressions. Occipital ridge and postocular region orange-yellow fading into the pale rear of the head. Antennae with scape and pedicel yellow, flagellum black. *Prothorax:* Grass-green merging into citron-yellow laterally and with some orange colour in the sutures. Both anterior and posterior lobes low and smoothly curved. *Synthorax:* Bright green merging laterally into citron-yellow beneath. The green is darkest on the dorsum to the first lateral suture and also in a vertical band just distal to the second lateral suture. At the dorsal end of each suture is a small elongated rust-brown spot, and on the dividing ridge of terga and pleura is a small triangular black spot beneath each pair of wings. A small, elongated black mark divides the metepimerum from the abdomen.

These are the only markings on the thorax and are present in all the species of *Ceriagrion* that I have examined, but are only prominent on the pale-coloured ones. The green colour of the mesopleurum becomes citron-yellow as it nears the legs. *Legs:* Pale greenish-yellow with the following black: all spines; a fine apical edge to the femora, a less well defined one to the tibiae and a dorsal apical edge to each joint of the tarsi; also tips of claws. The longer femoral spines number 3–4–5. *Wings:* Tinged with pale yellow, more hyaline towards the tips. Venation mostly black, but radius dark brown. Postnodals 11 fore wings, 9 hind wings. Medio-anal link present. Anal bridge at anal crossing; arculus at second antenodal. Pterostigma dark pinkish-grey, elongate and covering one cell, the angle somewhat oblique in fore wings and pronouncedly so in hind wings, about twice as long as broad and from 0.75 mm. to 1 mm. in length. *Abdomen:* Dorsally scarlet-red and with no pattern, shading laterally to citron-yellow on first and second segments and progressively more orange from third to tenth segments. There is a fine black ring at the posterior border of second to sixth segments and short black spines in the same position on seventh to ninth segments. Anal appendages as in fig. 2, the superiors black, with dark red at extreme bases; the inferiors red, with a stout black tooth. This tooth is broad and triangular, curved upwards and inwards and with a single, slightly obtuse tip. (The tooth in *corallinum* is slightly notched at the tip, forming a double point.)

The male paratype of *whellani*, from the type locality, only differs from the type by being half a millimetre longer in the abdomen and hind wing, and having 5 long spines on the right hind femur and 6 on the left. The penis is as drawn in fig. 2 and shows differences from that of *corallinum*. For a figure of the latter *see* Dr. E. Schmidt, 1951 (p. 160, fig. 17). In *whellani* there is a distinct " waist " to the apical lobe and a membranous flange laterally at the base. The stem is quite smooth, with no spines. Type and paratype: Southern Rhodesia, Melsetter District, Chibudzana River, 16.xi.1948 (B.M. Coll.).

Also belonging here and identical in shape of anal appendages is a male from Brit. E. Africa, Kome Island, Lake Victoria, taken at the N.W. end of the lake by Prof. G. D. Hale Carpenter, 11.i.1919 (B.M. Coll.). This specimen has the superior anal appendages coloured dark red. The arculus is distinctly distad to the second antenodal (and this is also the position in Fraser's two from Uganda). The specimen also has only 10 postnodals in the left fore wing and 8 in the right hind wing. None of these characters are really important, but it may eventually be thought best to give the Uganda specimens a racial name.

Ceriagrion corallinum Campion.

The holotype male from Rowerre, two co-type males from Port Lokko and Kamakoni and the allotype female from Kamakoni were all named by H. Campion from a series of six males and one female collected by Dr. J. J. Simpson in Sierra Leone, West Africa, April and May, 1912 (1914, *Ann. Mag. nat. Hist.* (8) **14**: 279–281). Another male, not seen by Campion, is also in the B.M. Coll. from Sierra Leone, Rosorse (Simpson, 27.xii.1912). I have seen a male from Cameroons, Tibati (Dr. Monard's coll., June, 1947). These six specimens are all that I can personally vouch for. It would, however, seem reasonable to suppose that the other two Sierra Leone males from the original series (wherever they are now) and a pair from the Belgian Congo (Tervuren Mus.) compared by Dr. Ris with the Sierra Leone series are true *corallinum*.

In a paper published in February, 1951, by Dr. E. Schmidt on the dragonflies of Portuguese Guinea (*Arqui. Mus. Bocage*, **20** (1949) : 158–161) *corallinum* is correctly figured and described, showing an extension of its range. These specimens are several millimetres longer than those of the type series.

Campion's description is very accurate, but one or two additions can usefully be made. For instance, I doubt that the " golden yellow stripes " exist in life. They are so indefinite in some of the specimens (although prominent in the types) that they are probably only post-mortem changes. I believe that the dorsal bronze-green is darker along the dorsal carina, in the humeral region and between the first and second lateral sutures. The tiny black marks are as in *whellani*, but the dark russet mark at the dorsal end of the second lateral suture is wider. I would have called the colour on the top of the head a mixture of reddish-brown (or rust) and green, and the legs have a brownish stripe along the outer surface of the femora but are otherwise yellow. What Campion describes as " a rather long acute point above " on the inferior anal appendage is what both Fraser and I prefer to call a tooth ; Campion omits to say that it is black. It undoubtedly is " acute " from many aspects but, nevertheless, under high magnification can be seen to be slightly notched and with a double tip. The whole tooth is not so broad and triangular as that in *whellani* and is not so decidedly curved upwards and inwards. Campion's " shorter blunter point below " is a description of the angled lower edge of the inferior appendage and does not refer to the tooth. Campion has also omitted reference to the minute tooth on the superior appendage, not found in *whellani*, but easily overlooked. I believe that the abdomen in the males is not such a deep shade of scarlet as it is in *whellani* ; Campion called it " light red."

Ceriagrion moorei sp. n.

Male holotype : abdomen 29 mm. ; hind wing 18 mm. Female allotype : abdomen 27 mm. ; hind wing 18 mm. Red and yellow.

Type ♂. *Head :* Entire lower face and rear of head and eyes orange-yellow, the labrum particularly bright and shiny. Clypeus, frons and the top of head to the occipital region scarlet-red. The eyes are bright green in life. Antennae with scape and pedicel orange-red, flagellum black. *Prothorax :* Scarlet-red, the anterior and posterior lobes being broad and rounded. *Synthorax :* Scarlet-red, to at least as far as the first lateral suture, unmarked and merging into yellow below, with some white pruinosity between the legs. *Legs :* Orange-yellow, unmarked, with stout, black spines, the longer ones on the femora numbering 3–4–5. Claws black. *Wings :* Tinged with pale yellow, more hyaline towards the tips. Venation largely red, brown towards the posterior borders. Postnodals 12 fore wings, 10 hind wings. Medio-anal link present. Arculus a fraction distad to the second antenodal in all wings. *Ab* at *ac*. Pterostigma pale red, moderately elongate in fore wings and more elongate, and the angle more acute, in hind wings, covering one cell ; about twice as long as broad and from 0·75 mm. to 1 mm. in length. *Abdomen :* Scarlet-red merging into yellow beneath, unmarked and only very slightly darker at the segment joints. Anal appendages as in fig. 3, and a light red, even to the spines and hairs, except for a black end to the rounded tip of the superior appendage and the large, shiny black tooth on the inferior appendage. Penis as in fig. 3, with a pointed end to the apical lobe similar to that in *suave* Ris (*see* Schmidt, 1951).

Allotype female : The head is duller and more yellow than the male, with no red clypeus and dull red-brown on top (part of which is obscured by some white incrustation). Red on prothorax and synthorax almost as extensive as in the male. The dorsum of the first

five abdominal segments scarlet-red, of the last five orange. Ovipositor and anal appendages orange, the left cercus entirely missing, the right one half as long as the tenth segment and only a narrow cone in shape.

Type male and female: Gold Coast, Northern Territories, Yapi, 1916 (*Dr. J. J. Simpson*). B.M. Coll.

Paratype male from type locality (headless) shows dorsal striping to the left of dorsal carina, proving that this appearance is due to post-mortem changes. Paratype female from type locality is larger than the allotype: abdomen

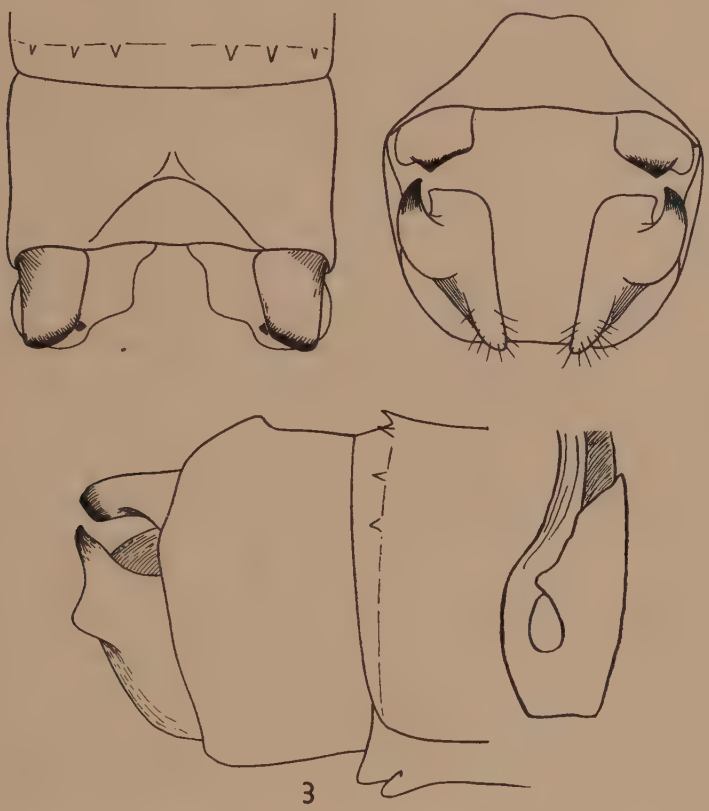


Fig. 3.—*Ceriagrion moorei* sp. n. Male anal appendages from above, behind and laterally. (Type ♂, Gold Coast.) Penis (♂, N. Nigeria).

30 mm., hind wing 19 mm.; also darker and greyer on thorax and abdomen. Other paratypes are 5 males: Northern Nigeria, S. E. Kano, Azare, 1925 (*Dr. Ll. Lloyd*), and 1 male: Gambia, Bathurst (no date), in B.M. Coll.; also 7 males and 7 females (two pairs *in cop.*) from Gambia, Kuntaur Post, Basse Casamance, July, 1948, and Wellingara, E. Casamance, August, 1948 (*N. W. Moore*, after whom the species is named). These specimens vary in age. Some are rather brighter red than the types (head, legs, thorax), some are yellower (legs, pterostigma, clypeus, front "shelf" of frons), some females are dorsally

browner or greyer. The position of the arculus is often distinctly distad to second antenodal, and the postnodals often number only 10 or 11 in the fore wings and 9 in the hind wings. The length of the abdomen varies between 27 and 30 mm. and hind wings 17–18 mm.

The female tenth abdominal segment is deeply notched dorsally in the centre, the notch being " open " and surrounded by a slightly raised edge. The conical cerci have a prominent tubercle below (and between), and the styles of the valves of the ovipositor do not extend beyond the end of the tubercle. In the female of *C. glabrum* (the only female compared) the notch on the tenth segment is narrow and there is no raised surround. The tubercle is small, very flat, and the styles project well beyond.

The mesostigmal lamina has lateral raised ridges and round black spots, similar to *suave*, but there is no mesotergal hollow. It might be helpful here to state that the allotype female of *ignitum* Campion has the black streak of *corallinum* and the shape closely similar, but with the mesotergal hollow slightly deeper. These thoracic structures may or may not be of use in identification as so few females are as yet known, but these particular structures should have specific value.

C. moorei must closely resemble *C. suave* Ris (Belgian Congo, Katanga), the anal appendages of the male as drawn by both Ris and Fraser being very similar. However, the outer border of the inferior appendage is not angulated as it is in *moorei*. Ris describes the males of *suave* as 36 mm. long and of extreme slimness, and the colouring as very pale.

I have analysed the characters of 28 of the 30 named species of the genus *Ceriagrion* with a view to finding some stable generic character for the whole genus, but, of those mentioned in published Keys I find only four to be completely reliable and none are confined solely to *Ceriagrion*. These four characters are : no horns on the female prothorax ; no spine beneath the female eighth abdominal segment ; an inferior tooth present on all the tarsal claws ; a medio-anal link in all wings (M. A. Lieftinck gives his reasons for considering the medio-anal link an unreliable generic character in *Nova Guinea* (1935, **17** : 235–236)). Fraser's new species from Madagascar, *madagazureum*, is the *only* one with well-defined postocular spots, although there is sometimes a change of shade in the colouring of the occipital region. This large blue species, *C. madagazureum*, has also the thorax mostly black dorsally ; the European small red species, *C. tenellum*, is the only other species with such a thoracic pattern. I am, therefore, leaving these two species out of this examination, as I am doubtful that they should be included if we are going to get even a minimum of uniformity in the genus. I cannot include E. Schmidt's two new species from Madagascar, as the full descriptions are not yet available.[1] That leaves 26 species, either examined or taken from the type descriptions. The generotype *coromandelianum* (Fabr.) has the following characters : (1) Thorax green. (2) Abdomen lemon-yellow. (3) Unmarked by any pattern. (4) Stature long and slim or fairly so. (5) A sharply crested frontal ridge. (6) Anal bridge (*ab*) at anal crossing (*ac*). (7) Arculus distinctly distad to second antenodal, or slightly distad, or at the second antenodal. (8) Pterostigma rhomboidal. (9) Long and narrow inferior appendages in the male. (10) Wide

[1] Published late 1951 (1951, *Mém. Inst. Scient. Madag*: A, VI, 1 : 264–273) and including a discussion on the sizes of *C. glabrum*.

occiput, with (11) a rolled-up posterior edge, and (12) distinctly concave posteriorly. (13) Labium cleft to half the total length, and (14) the cleft narrow. (15) Prothorax narrow. (16) Synthorax wide. (17) The longer leg spines on the femora sparse.

Characters for 26 *Species* (*examined or taken from type descriptions*) :

(1) Thoracic colour : 16 green or olivaceous, 6 red, 4 blue.
(2) Abdominal colour : 19 red, 5 yellow, 2 blue.
(3) Pattern : 15 unmarked, 11 marked with some black.
(4) Stature : 8 long and slender (30–36 mm.), 8 medium length and slender, 3 long and not so slender, 4 small and slender (23–26 mm.), 3 of mixed stature.
(5) Frontal ridge : 20 well defined, 4 moderate, 2 with very little of the ridge to be seen (and it is to be remembered that this does not include *tenellum* or *madagazureum*, neither of which have a sharply defined frontal ridge).
(6) Position of anal bridge : 16 at anal crossing, 5 proximal to *ac*, 5 variable.
(7) Position of arculus : 10 distad to second antenodal, 10 at second *an*, 6 variable.
(8) Shape of pterostigma : 24 rhomboidal, 2 quadrate.
(9) Shape of inferior appendage : 13 tapering to narrow tip, 8 broad all the way, 5 intermediate.

The following characters I have myself examined on 21 of the 30 species :

(10) Width of occiput between eyes : 10 wide, 4 narrow, 7 intermediate.
(11) Posterior edge of occiput : 11 rounded, 9 rolled up.
(12) Posterior edge of occiput with a distinct concave depression in centre : 7 deep depression, 5 shallow, 1 variable, 8 with none.
(13) Cleft in labium : 6 to half of total length, 11 to almost half, 2 to one-third, 2 variable.
(14) Shape of cleft in labium : 14 narrow, 4 wide, 3 variable.
(15) Width of prothorax : 6 wide, 8 narrow, 12 intermediate.
(16) Width of synthorax : 9 wide, 7 narrow, 10 intermediate.
(17) Femoral spines : 8 very sparse (2–3 foreleg, 4 mid, 5 hind), 6 fairly sparse (3.4.6), 3 moderately numerous (3.5.6), 2 numerous (3.6.6–8). In addition, *erubescens* Selys from Australia has 2–3.4.5, and from China and Annam 3.4.5–7 ; *olivaceum* Laidlaw from Burma has 3.4.7, and race *aurantiacum* Fraser from India 3.4.5.

In all these species only two are different from the type in as many as two characters, and neither the Oriental nor Ethiopian can be grouped by any set of characters. The nearest approach to grouping lies in the shape of the male inferior appendage, which is tapering in 12 out of 14 oriental species, and broad in 8 out of 12 Ethiopian species, with one West African definitely tapering, 3 West African and a Burmese and a Javanese species intermediate.

The widely spread and very common African species, *C. glabrum* Burmeister, would appear to be at its longest and stoutest, with large dark eyes, from most of its eastern and southern range, certainly from Abyssinia, Kenya, Tanganyika, Uganda, Belgian Congo (eastern plateau), S. Rhodesia, Transvaal, S. W. Africa and Angola. In the west, in Sierra Leone, Gold Coast and Nigeria, a form is found which is smaller and slimmer in stature, with smaller, light eyes. However,

in the latter country the larger, stouter and dark-eyed form seems to be equally common. Over the entire range the stout spines on the postero-lateral edge of the tenth abdominal segment number from 1 to 6 (3 or 4 being usual), and the male anal appendages show no variation in shape, even in those from the islands of Madagascar, Seychelles, Mauritius, San Thomé and Principe. Correctly named females of this species from Kenya and Abyssinia have the mesostigmal lamina almost identical with the drawing for *C. suave* by Schmidt (1951). Dr. Barnard figured the penis of this species, showing that it is another with spines on the stem (1937, *Ann. S. Afr. Mus.* **32** : 217). Some investigations on the ecology of this dominant species and on the rarer ones that it would appear to be supplanting would be of great interest.

Book Notices.

The Collecting and Preservation of Butterflies and Moths, with Practical Hints for Collecting in the Field. By Chas. B. Antram. 8vo. Lymington (Charles T. King), 1951. Pp. 107, 6 half-tone pls., 12 line figs. Price 10*s.* 6*d.*

After a chapter " For the Absolute Novice," this book deals with apparatus and collecting methods, and gives a series of " Observations and Hints " on the arrangement and maintenance of a collection. There is a list of the food-plants of British butterflies, and notes on beating, rearing of larvae, assembling, sugaring, light-traps, and pupa-digging. A table gives the normal time of appearance and method of hibernation of the British butterflies, and there is a Glossary.

Entomology for Introductory Courses. By Robert Matheson. 8vo. Ithaca, New York (Comstock Publishing Company) and London (Constable & Co.). 2nd edition. 1951. Pp. xiv + 629, 500 figs. Price $6.00.

It is stated that " though the structure of insects, both external and internal is reviewed and illustrated, the main emphasis is on the living insect." After a short general introduction there is a chapter on the Classes of arthropods, and an outline of insect morphology. Mouthparts have a separate chapter, and development, growth and metamorphosis are reviewed. Classification with a key to Orders (adults only) is followed by successive chapters on the respective Orders. Finally, under the general title of " Insects in Relation to Human Welfare," come four chapters dealing respectively with insects as benefactors, scavengers and in the balance of nature ; as pollinators ; as vectors of disease ; and as plant pests. A Glossary and a Bibliography complete the volume.

Though general in scope, the book is mainly preoccupied with North American entomology ; locusts, for example, receive about one and a half pages of the chapter on Orthoptera, and one page of this is about the Rocky Mountain Locust. The Bibliography, however, includes general works from many countries.

SOME NEW SPECIES OF GALL MIDGES (DIPTERA: ITONIDIDAE) FROM INDIA.[1]

By S. N. Rao, M.Sc., Ph.D., F.R.E.S.

(*U.P. State Research Associate, School of Entomology, St. John's College, Agra, India.*)

The type-specimens of the four new species of gall midges described here are deposited in the collections of the Zoological Survey of India, Indian Museum, Calcutta. My thanks are due to Prof. M. S. Mani for helpful criticism.

Subfamily Heteropezinae.

Haplusiella gen. n.

Eyes confluent above. Trophi elongate. Palpi four-segmented. 15 antennal segments; in ♂ all flagellate segments elongate-oval; first and second flagellate segments fused together, circumfila wanting. Wings unspotted, longer than broad, with three long veins, *Rs* well developed and distinct; costa interrupted at its union with R_5, and the latter curved distally and reaching the wing margin well beyond the apex; Cu–M_4 forked. Legs long, slender, moderately setose. Claw pectinate, with five teeth. Basal clasp segment simple, long, slender; terminal clasp segment more slender and longer than the basal, evenly curved and with one blunt tooth apically; dorsal plate broad, deeply and broadly cleft with the lobes narrow and long; ventral plate narrower and a little shorter than the dorsal plate, deeply and broadly cleft with the lobes narrow; style equal to the ventral plate.

Type species.—*Haplusiella pectiniclava*, sp. n.

Haplusiella pectiniclava sp. n.

♂. Length 1·0 mm. Light brown. Eyes confluent above. Trophi elongate. Palpi (fig. 3) pale brown, four-segmented, long, sparsely hairy; first segment nearly cylindrical, slightly wider apically than at base, length four times the thickness at apex; second segment longer than first, length four and two-thirds the thickness, very slightly narrowed apically; third segment shorter and more slender than the second, length four times the median thickness, slightly bulging towards the apical three-fourths; fourth segment slightly shorter than the third, narrower basally than at apex, length four and two-thirds the maximum width. Antenna pale brown, a little longer than half the length of body, with 15 segments; flagellate segments elongate oval, sparsely setose, with very short stems, gradually becoming shorter and more slender towards the tip. Scape (fig. 4) subquadrate, one and a half times as long as broad, pale brown; pedicel (fig. 4) slightly longer than scape, length one and one-fourth the diameter, pale brown; first flagellar segment (fig. 4) fused with the second, longer than pedicel, length a little over twice the thickness, with a very short basal stem; second segment as long as the first, but somewhat more slender, length a little less than thrice the thickness, with a very short spical stem; third segment slightly shorter and more slender than the second, length two and a half times the thickness; fourth segment like the third; fifth slightly shorter than the fourth, length a little over twice the thickness; ninth segment twice as long as thick; fourteenth segment (fig. 5) shortest of all segments, twice as long as thick; terminal segment (fig. 5) with an apical knob of about one-third the

[1] Contribution No. 13 from the School of Entomology, St. John's College, Agra, published with the permission of the Professor of Zoology and Entomology.

length of the segment, length thrice the thickness. Mesonotum brown. Scutellum and postscutellum pale brown. Abdomen yellowish-brown. Halteres pale yellow. Wings (fig. 1) hyaline, twice as long as broad, with three long veins, costa sparsely setose nearly for the basal half; R_1 sparsely setose and uniting with costa before the middle; *Rs* distinct, almost at a right angle to R_1; R_5 reaching the wing margin well beyond the apex, slightly curved distally, interrupting the costa at its union with the latter; $Cu–M_4$ forked. Legs very long, slender, moderately hairy; metatarsus shorter than the fifth tarsal segment; second tarsal segment longest of all and longer than the rest of the segments combined. Claw (fig. 19) pectinate, with five teeth. Empodium shorter than claw. Basal clasp segment (fig. 18) simple; terminal clasp segment longer and more slender than the basal clasp segment; length nearly ten times its thickness in the middle, evenly curved and ending in a dark brown blunt tooth; dorsal plate three-fourths the basal clasp segment, broad, deeply and broadly cleft almost up to the base; lobes long and narrow; ventral plate narrower and very slightly shorter than the dorsal plate, broadly cleft in the middle almost to the base; style a little shorter than the ventral plate, somewhat broader basally than at apex, length nearly four times the median thickness.

Holotype, 1 ♂ on slide No. 2150/H6. Laboratory, School of Entomology, St. John's College, Agra. S. N. Rao coll. "At light," 10.ix.1949.

Subfamily Itonididinae.

Tribe Lasiopterini.

Lasioptera indica sp. n.

♀. Length 0·7 mm. Brown. Palpi (fig. 9) four-segmented, moderately setose, pale yellow; first segment wider apically than at base, longer than the greatest width; second segment narrowed apically, nearly twice as long as wide, cylindrical; third and fourth segments equal, each more slender than the second, of uniform thickness, length a little over thrice the thickness. Antenna less than half the length of the body, brown, with 16 segments; the segments cylindrical, sessile, gradually becoming shorter and more slender. Scape (fig. 6) widest apically and slightly wider than long; pedicel (fig. 6) subglobose; first flagellar segment cylindrical, moderately setose, setae nearly as long as the segment, one and two-thirds as long as thick; second segment (fig. 6) equal to and fused with the first; third segment nearly equal to the first; fourth and fifth segments each slightly more slender than the third with a length one and one-third the thickness; ninth segment more slender than the fifth, a little longer than thick; eleventh segment more slender than ninth, a little longer than thick; terminal segment (fig. 7) more slender than the penultimate, length a little less than twice the thickness. Mesonotum brown. Scutellum and postscutellum light brown. Abdomen light brown, half the length of the body. Wings (fig. 2) hyaline, with three long veins; length a little over one and one-half times the width; R_5 uniting with costa a little beyond the middle of the wing; $Cu–M_4$ forked. Halteres pale yellow. Legs long, hairy, metatarsus very slightly shorter than the fifth tarsal segment, second segment longest but slightly shorter than the rest of the segments combined. Claw light brown, evenly curved, bifid. Empodium shorter than claw. Ovipositor exserted, long, with conspicuous hooks.

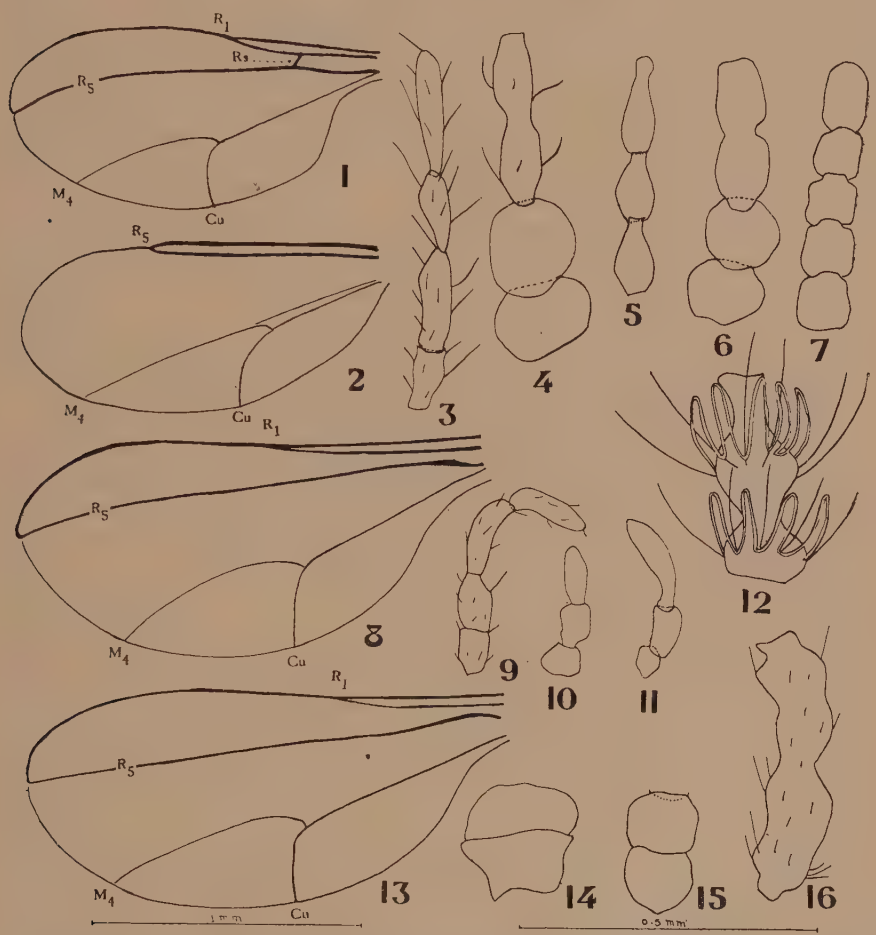
Holotype, 1 ♀ on slide No. 2151/H6. Hewett Park, Agra. M. S. Mani coll. "At light," viii, 1947.

This species runs very close to *L. paniculi* Felt (1920), but is easily separated by the light brown colour of the abdomen, the antenna having 16 segments, the length of the third flagellate antennal segment being one and two-thirds its width, the two terminal palpal segments being equal and the empodium being shorter than the claw.

Neolasioptera cephalandrae Mani.

1934, *Neolasioptera cephalandrae* Mani, *Rec. Indian Mus.* **36** (4) : 397, ♀.
1936, *Neolasioptera cephalandrae* Mani, *Rec. Indian Mus.* **38** (2) : 193, ♂.

I have before me several males and females of this midge reared from gall No. 219 on stem of *Coccinia indica* W. & A. collected in the St. John's College grounds (to the north of Women's Hostel) in September and October this year. The midges are heavily parasitized by Chalcids. This species has so far been recorded from Calcutta, Coimbatore, Erode, Madras, Tanjore and Vellore.



FIGS. 1–16.—(1, 2) Fore-wing of (1) *Haplusiella pectiniclava* ♂, gen. et sp. n. (2) *Lasioptera indica* ♀, sp. n. (3—5) *H. pectiniclava* ♂. (3) Palpus. (4) Scape, pedicel and first two flagellar segments of antenna. (5) Three terminal flagellar segments of antenna. (6, 7) *L. indica* ♀. (6) Scape, pedicel and first two flagellar segments. (7) Five terminal flagellar segments. (8) *Amraemyia keshopurensis* ♂ sp. n., fore-wing. (9–11) Palpus of (9) *L. indica* ♀. (10) *A. keshopurensis* ♂. (11) *Schizobremia bangalorensis* ♂ sp. n. (12) *A. keshopurensis* ♂, fourth flagellar segment of antenna. (13) *S. bangalorensis* ♂, fore-wing. (14, 15) Scape and pedicel of (14) *A. keshopurensis* ♂, (15) *S. bangalorensis* ♂. (16) *S. bangalorensis* ♂, first two flagellar segments of antenna.

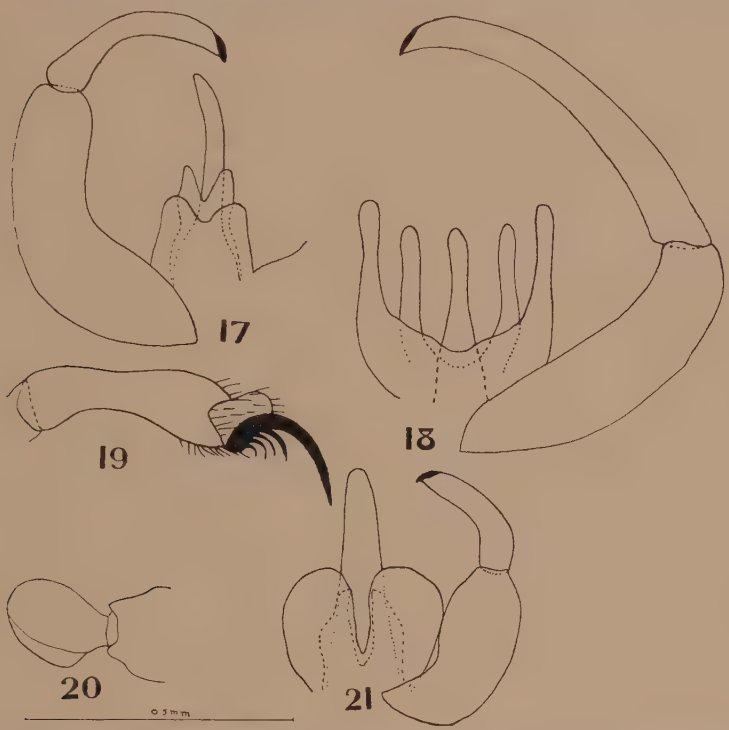
Tribe Itonididinini-bifila.

Amraemyia keshopurensis sp. n.

♂. Length 1·0 mm. Brown. Eyes confluent above. Trophi not produced. Palpi (fig. 10) three segmented, brown, sparsely hairy ; first segment broadest subapically, length one and one-fifth the maximum width ; second segment one and one-third the first and broader subapically than at base, length a little more than its own diameter ; third segment longest of all, one and one-fourth the second, twice as long as thick. Antenna light brown, a little less than one and one-fourth the length of the body, with 14 segments, segments all binodose, gradually becoming more slender and slightly shorter towards the apex ; with two whorls of circumfila, nearly equal to the stems in length ; with two whorls of moderately long hairs. Scape (fig. 14) brown, darker than the rest of antenna, wider at apex than at base, irregularly triangular, length nearly half the width at apex ; pedicel (fig. 14) subglobose, brown, darker than the flagellum, length two-thirds the median width ; first flagellar segment fused with the second, nearly four times as long as the scape, with a short basal and a long apical stem ; length of basal enlargement about one-third the length of the segment and a little more than its own thickness ; length of basal stem one-third its own thickness ; apical enlargement very slightly narrower and shorter than the basal enlargement, length a little less than its own thickness and a little more than one-third the length of the segment ; apical stem long, three-fourths the length of the apical enlargement, nearly one and a half times as long as thick. Second flagellar segment a little shorter than the first ; basal enlargement globose, as long as broad, a little less than one-third the length of the segment ; basal stem three-sevenths the length of the basal enlargement, one-eighth the length of the segment and nearly as long as thick ; apical enlargement globose, as long as thick, nearly one-third the length of the segment ; apical stem a little less than one-third the length of the segment, nearly thrice as long as thick, a little less than the length of the apical enlargement. Third segment very slightly shorter than the second ; basal enlargement a little less than one-fourth the length of the segment, three-fourths as long as thick ; basal stem two-fifths the length of the basal enlargement and five-sevenths as long as thick ; apical enlargement longer and slightly stouter than the basal enlargement, globose, a little over one-third the length of the segment ; apical stem twice as long as thick and as long as the basal enlargement. Fourth and the following segments (fig. 12) somewhat shorter and more slender. Mesonotum dark brown. Scutellum dark brown. Postscutellum a little lighter than scutellum. Abdomen brownish-black. Halteres brown. Wings (fig. 8) hyaline, a little less than twice as long as broad, with three longitudinal veins. Costa slightly thickened basally and interrupted at its union with R_5 ; R_1 uniting with costa at about the middle of wing ; R_5 thicker basally, slightly curved distally and joining the costa beyond the wing tip ; Cu–M_4 forked. Legs long, light brown, with black hairs, metatarsus shorter than the second tarsal segment, as long as the terminal tarsal segment and nearly one-eighth the length of the second tarsal segment ; the latter longest of all, longer than the rest of the tarsal segments combined ; third segment a little over one-third the second, fourth four-fifths the third. Claw pale brown, long, slender, bent almost at right angles distally, bifid basally. Empodium as long as the claw. Basal clasp segment (fig. 17) stout, thrice as long as wide, without basal lobe ; terminal clasp segment stout, about half the basal clasp segment, nearly eight times as long as the thickness in the middle, slightly curved, tapering toward the apex, ending in a blunt dark brown tooth. Dorsal plate a little over half the length of the basal clasp segment, moderately incised in the middle, the lobes bluntly pointed apically ; ventral plate one-fourth longer than the dorsal plate, more slender than the latter, nearly six times as long as thick, incised in the middle only up to the apical fourth ; tips of lobes pointed, sparsely hairy, not broadened basally ; style slender, nearly as long as the basal clasp segment.

♀. Length 1·2 mm. Brown. Eyes confluent above. Trophi produced. Palpi short, brown, three segmented, sparsely hairy, first segment nearly globose, wider than long, second segment one and one-half times longer than the first, widest at base, a little longer than

the maximum width ; third segment longest of all, more slender than the second, length two and two-thirds times its own thickness and one and one-third the second. Antenna as long as the body, light brown with 14 cylindrical and sessile segments ; flagellate segments with short stems, with two loops of circumfila, two whorls of setae, gradually becoming slender towards the apex. Scape brown, roughly triangular, widest at apex, length nearly half the width at apex ; pedicel brown, subglobose, wider than long. First flagellar segment fused with the second, nearly twice as long as scape ; second segment as long as the first, slightly more slender, nearly twice as long as thick, stem very short, one-twelfth the length of the segment ; third segment as long as the second, twice as long as thick, stem one-eighth the length of the segment ; fifth segment similar to the third but with the stem only one-seventh



FIGS. 17–21.—(17,18) Male genitalia of (17) *A. keshopurensis*. (18) *H. pectiniclava*. (19) *H. pectiniclava* ♂, hind claw. (20, 21) *S. bangalorensis*. (20) Ovipositor. (21) Male genitalia.

the length of the segment ; ninth segment as long as the fifth, more slender, length a little less than twice the thickness, stem one-sixth the length of the segment ; eleventh segment as long as the ninth, more slender, length twice its own thickness, stem one-sixth the length of the segment ; terminal segment twice as long as thick, with an apical knob of one-sixth the length of the segment. Mesonotum very dark brown. Scutellum and postscutellum dark brown. Abdomen reddish-brown. Halteres pale brown. Wings and legs as in ♂. Ovipositor short, brown, finely setose, slightly exserted, terminal lobes oval, twice as long as broad.

Holotype 1 ♂ and *allotype* 1 ♀ on slide Nos. 2152/H6 and 2153/H6. Keshopur (U.P.), S. N. Rao coll. " Reared from light yellow small round gall No. 332 on leaf of *Mangifera indica* Linn.," 10.ix.1948.

This species runs close to *Amraemyia brunnigallicola* Rao (1948), but is readily separated by the longer third palpal segment in ♂, the obtusely pointed lobes of the dorsal plate, the ventral plate not abruptly broadened basally and the oval terminal lobes of the ovipositor.

Procontarinia matteiana Kieffer & Cecconi.

1906, *Procontarinia matteiana* Kieffer & Cecconi, *Marcellia*, **5** : 135.
1943, *Procontarinia matteiana* Mani, *Indian J. Ent.* **5** : 159.

I have before me a few males and females reared from gall No. 192 on leaf of *Mangifera indica* Linn. in July and August and males and females received from Mr. P. L. Chaturvedi, Assistant Entomologist, and labelled as reared from the same gall at Kanpur. This species has been previously recorded from Calcutta, Coimbatore, Dehra Dun, Kanpur, Ranchi and Tanjore.

Tribe Itonididinini-trifila.

Schizobremia bangalorensis sp. n.

♂. Length 0·9 mm. Brown. Eyes confluent above. Trophi not produced. Palpi (fig. 11) three-segmented, light brown, sparsely setose ; first segment darker than the rest, nearly as long as thick, shortest of all ; second segment one and two-thirds the length of the first, widest at the apex ; third segment longest of all, a little longer than the first two segments combined, one and two-fifths the length of the second, nearly four times as long as thick and more slender than the second. Antenna brown, flagellate segments all binodose, gradually becoming slender towards the apex with three whorls of circumfila ; loops nearly as long as the diameter of the enlargements ; with three whorls of hairs. Scape (fig. 15) subglobose, dark brown, very slightly broader than long ; pedicel (fig. 15) as long as the scape, subglobose ; first flagellar segment (fig. 16) fused with the second, nearly thrice as long as the scape, with short basal and apical stems, basal enlargement globose, very slightly narrower than the apical enlargement, two-sevenths the length of the segment and a little wider than long ; basal stem very short, length one-third its own thickness ; apical enlargement nearly cylindrical, slightly wider apically than at base, length one and one-third the thickness, slightly constricted at about the middle ; apical stem a little over one-third the length of the apical enlargement, as long as thick. Second segment (fig. 16) as long as the first, basal enlargement slightly narrower than the apical enlargement, globose, as broad as long, nearly one-third the length of the segment ; basal stem two-fifths the length of the basal enlargement and one and one-fourth as wide as long ; apical enlargement cylindrical, slightly narrower basally, very slightly longer than broad, apical stem a little less than one-third the length of apical enlargement. Third segment as long as the second, slightly narrower ; basal enlargement slightly narrower than the apical enlargement, globose, a little over one-third the length of the segment ; basal stem two-fifths the length of the basal enlargement, and nearly one and one-fourth times as wide as long, apical enlargement cylindrical, slightly narrower basally, slightly longer than broad, apical stem a little less than one-third the length of the apical enlargement. Mesonotum dark brown. Scutellum and post-scutellum slightly lighter than mesonotum. Abdomen brown. Halteres pale brown. Wings (fig. 13) hyaline, length two and one-third the breadth, costa interrupted at its union with R_5, R_1 uniting with costa at its basal quarter, R_5 nearly straight and reaching the wing margin at apex, Cu–M_4 forked. Legs long, brown, moderately hairy, metatarsus shorter than the second tarsal segment, two-thirds the fifth tarsal segment ; second tarsal segment longest of all and longer than the following three segments combined, third segment nearly one-third the second, fourth shorter than the third. Fore claws bifid, brown, evenly curved ; hind claws simple. Empodium about half the length of the claw. Basal clasp segment (fig. 21) stout, terminal clasp segment three-quarters the length of the basal clasp segment,

slightly curved, gradually becoming narrower towards the apex, and ending in a dark brown blunt tooth. Dorsal plate short, three-fourths the basal clasp segment, deeply incised in the middle, with the tips of the lobes roughly rounded ; ventral plate slightly shorter than the dorsal plate, very much narrower than the latter, broader at apex than at base, deeply incised in the middle, lobes linear. Style stout, long, nearly twice as long as the dorsal plate and slightly narrowed toward the apex.

♀. Length 1·0 mm. Brown. Eyes confluent above. Trophi not produced. Palpi sparsely hairy, light brown, three-segmented ; first segment subcylindrical, one and one-third times the thickness ; second segment one and three-fourths times the length of the second, a little over twice as long as thick ; third segment longest of all, a little less than twice the length of the second, more than thrice as long as thick. Antenna brown, with 14 segments, shorter than body, flagellate segments cylindrical, sessile, with very short stems, segments gradually becoming shorter and more slender towards the apex. Scape and pedicel brown, darker than the flagellum, wider at apex than at base, length equal to the width at apex, pedicel subcylindrical, nearly as long as broad. First flagellar segment fused with the second, twice as long as thick, stem a little less than one-fourth the length of the segment and one-third the length of the enlargement and as long as thick ; second segment very slightly shorter than the first, stem one-eighth the length of the segment and two-thirds as long as thick ; third flagellar segment slightly shorter than second, twice as long as thick, stem two-thirds as long as thick, one-eleventh the length of the segment. Mesonotum brown. Scutellum and postscutellum slightly lighter than mesonotum. Abdomen brown. Halteres pale brown. Wings hyaline, two and a half times as long as broad. Legs somewhat stouter, otherwise as in ♂. Ovipositor (fig. 20) short, terminal lobes oval, with a length a little less than twice its width.

Holotype, 1 ♂, *allotype*, 1 ♀ on slide Nos. 2154/H6 and 2155/H6. Bangalore, V. K. Subramanyam coll. " Host *Pseudococcus* sp. on cotton," 29.i.1949.

Received from the Entomologst, Fluted Scale Control Scheme, Bangalore.

This species differs from *S. malabarensis* Felt (1927) from South India in its smaller size, empodium being only three-fourths the claw and the ventral plate shorter than the dorsal plate.

References.

Felt, E. P., 1920, *Philip. J. Sci.*, **17** : 232.
——, 1927, *Mem. Dep. Agric. India* (*Ent.*), **10** : 1–2.
Karsch, F. A. F., 1877, *Revision der Gallmücken*, p. 16.
Rao, S. N., 1948, *Indian J. Ent.* **10** : 39.

Book Notice.

Bees : Their Vision, Chemical Senses, and Language. By Karl von Frisch. 8vo. Ithaca, N.Y. (Cornell University Press) and London (Geoffrey Cumberlege), 1951. Pp. xiii + 119, 61 figs. Price 18*s*.

The text of three lectures given in the United States by Prof. von Frisch on his famous experiments on the behaviour of bees, and the interpretations he gives to them. The lectures are on colour sense, chemical sense, and the language of bees, respectively. An appendix describes later (1949) experiments on the significance of polarized light in the mechanism of orientation of bees.

REDESCRIPTION OF *CHOREUTINULA LIBYCA* (COLLEMBOLA: HYPOGASTRURIDAE).

By H. E. Goto, B.Sc., F.R.E.S.

(*Department of Zoology, Imperial College, London, S.W.7.*)

Subsequent to the original description of *Choreutinula libyca* from Tripoli by Caroli in 1914 no further specimens were found until 1950,[1] when a number were taken in Devonshire (Goto, 1951).

Choreutinula libyca (Caroli, 1914) Paclt, 1944.

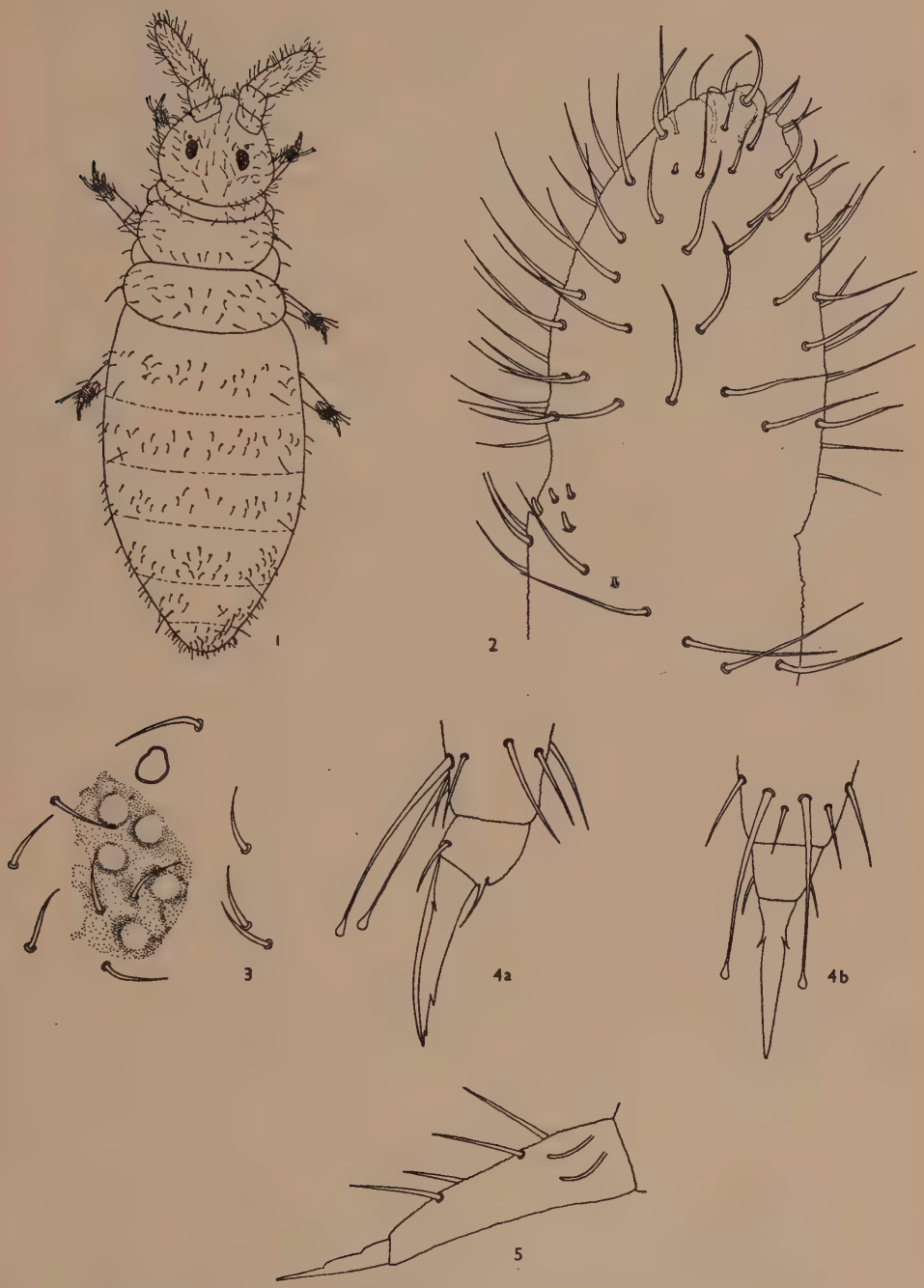
Beckerella libyca Caroli, 1914.
Mesogastrura libyca Bonet, 1931.
Schoettella libyca Denis, 1931.
Mesachorutes libyca Delamare Deboutteville, 1947.

Ground-colour whitish with small mainly spherical granular pigment patches present on head, thorax, abdomen and antennae. Pigmentation weaker in young specimens. Antennal patches darker and more numerous towards the base. (In specimens preserved in 70 per cent. alcohol and examined with direct illumination and also in those mounted in media not giving great clearance the pigment appears to be blackish. When mounted in media such as Salmon's polyvinyl lactophenol or Berlese's fluid the head patches appear distinctly blue and the trunk patches a paler greyish-blue.) Integument tuberculate and finely granular. Sparse clothing of mainly short setae (fig. 1), some of which are finely serrated. A longer seta is present on either side of the tergites of Th. II to Abd. VI. Maximum length, excluding antennae, 1·5 mm. Antennae about same length as head with segments as 1 : 1·3 : 1·3 : 2. Ant. III and IV more or less fused together. Five short sense rods in anterolateral region of Ant. III arranged as in fig. 2. Sensory (olfactory) setae of Ant. IV probably absent. (In some specimens there appear to be, on Ant. IV, 4–5 setae similar to the normal setae except that they are blunt-tipped and tend to be fairly sharply bent near the base. These may possibly represent the so-called olfactory hairs.) Ant. IV bears, near the apex, a very short sense rod and a sub-apical pit. Terminal retractile organ of Ant. IV trilobed. Postantennal organ flat, sub-circular, with double outline and with practically no tendency to be lobed, situated in a shallow triangular depression just anterolateral to the eye patch (fig. 3). Diameter of the postantennal organ approximately that of a single eye. Eyes normally five on each side of the head and situated in pigmented patches. Mouth parts manducatory. Mandible with four apical teeth and a basal molar area. Claw (fig. 4) with a pair of lateral teeth, a large one about two-thirds from the base and a smaller indistinct one close to the apex. Unguiculus bristle-like and about one-third the length of the claw. Tibiotarsus with two well-developed tenent hairs (fig. 4), which tend to be somewhat undulating (this is probably an artefact caused by preservation in alcohol). Segmentation of the abdomen rather indistinct (fig. 1). Rami of the retinaculum each with three blunt teeth. Furcula (fig. 5) a little shorter than the antennae. Manubrium about equal in length to the dens. Dens with four dorsal setae and a pair of elongate curved manubrial hooks on the inner face near the base of each dens. Mucro approximately three-sevenths the length of the dens and with two well-marked indentations on the dorsal side. Anal papillae and anal spines absent.

Distribution: Tripoli, England.

The differences in the above description from that given by Caroli are mainly in the nature of additions. Caroli omitted any description or figure of the sense organs of Ant. III, merely stating that they are typical. However, the typical

[1] See Appendix for a further record from France.



FIGS. 1–5.—*Choreutinula libyca*. (1) Dorsal view, somewhat distorted by flattening. (2) Ant. IV and apex of Ant. III. (3) Right eye and postantennal organ. (4*a*) Inner view of left hind claw and apex of tibiotarsus. (4*b*) Dorsal view of left hind claw and apex of tibiotarsus. (5) Inner view of mucro and dens.

number of sense rods on this segment of the generotype, *Choreutinula inermis* (Tullberg, 1871), which is the only other species in the genus, is four. Caroli failed to mention that the apical retractile organ of Ant. IV is trilobed. In this respect *C. libyca* again differs from the generotype, in which this structure is simple. The sub-apical pit and the short sense rod mentioned above as being present on this segment are structures not previously described for this genus. The double outline of the post-antennal organ is a further feature not described by Caroli and not present in *C. inermis*. One of the most striking differences from the compared species is the reduction in the number of eyes from eight to five on each side. The five present in *C. libyca* probably represent A, B, C, E and F according to the notation employed by Guthrie (1906). It is interesting to note that one of the specimens has six eyes on one side whilst two others have, on one side, only four eyes. On account of these variations within the species it would seem that the number of eyes is not a very stable feature, and consequently no very great importance should be attached to it as a systematic criterion. There seems to be no reason on this account, therefore, for separating this species generically. An attempt was made to determine which eyes were concerned in the teratological specimens by means of their positions relative to the positions of the setae on and near the eye patches. Unfortunately there is a shift in the normal positions of some of the eyes both when an extra eye is present and when one of the usual five is lost, so that any use of chaetotaxy for this purpose is, at best, rather speculative. The pair of lateral teeth on the claws was not described by Caroli and is indeed very difficult to see in lateral view, but is quite distinct when viewed either ventrally or dorsally (fig. 4*b*). Similar lateral teeth are present in *C. inermis*. *C. libyca* also differs from the compared species in the relative lengths of the manubrium and the dentes. In the former the manubrium is about equal in length to the dentes, whilst in *C. inermis* the manubrium is a little longer than the dentes.

These differences may be used as follows to add further couplets to the key separating the two species of the genus *Choreutinula*.

Key to the Species of the Genus Choreutinula *Paclt*, 1944.

Five sense rods in antero-lateral region of Ant. III. " Olfactory hairs " of Ant. IV about equal in dimensions to normal antennal setae. Short sense rod and sub-apical pit on Ant. IV. Terminal retractile antennal organ trilobed. Postantennal organ with double outline. Eyes five on each side of the head. Claw with two inner teeth. Manubrium about equal in length to dens. Mucro approximately three-sevenths length of dens and with two well-marked dorsal indentations. Maximum length 1.6 mm.

Choreutinula libyca (Caroli, 1914).

Tripoli, Devonshire (England).

Four sense rods on Ant. III. Olfactory hairs of Ant. IV shorter and stouter than normal setae. No short sense rod or sub-apical pit on Ant. IV. Terminal retractile antennal organ simple. Postantennal organ with single outline. Eyes eight on each side. Claw with one inner tooth. Manubrium little longer than dentes. Mucro two-thirds to four-fifths the length of the dens and without marked dorsal indentations. Maximum length 1 mm.

Choreutinula inermis (Tullberg, 1871).

Austria, Bohemia, Finland, France, Germany,
Poland, Scandinavia, Switzerland.

Choreutinula libyca was originally placed by Caroli in the genus *Beckerella* Linnaniemi (Axelson), 1912. As this name is preoccupied by a genus of Diptera (Enderlein, 1911), Paclt (1944) proposed that the name *Choreutinula* should replace *Beckerella* ; in the following year Salmon proposed the name *Beckerellodes*. The present author (Goto, 1951*a*) has published a short note sinking Salmon's name as a junior synonym of that published by Paclt. A considerable amount of controversy has arisen concerning the position of the genus *Choreutinula* within the family Hypogastruridae Börner, 1913 (=Neogastruridae Stach, 1947) (*see* Bonet (1931), Denis (1931), Delamare Deboutteville (1947) and Stach (1949)). As a diagnosis of the genus and a redescription of the generotype together with notes on the systematic position of *Choreutinula* are given by Stach it is not proposed to add anything to these. If, however, *libyca* is to be retained in the genus *Choreutinula*, as proposed by Stach and accepted here, it becomes necessary to widen the diagnosis of the genus, as given by the latter author, by the addition of the new characters mentioned above.

Some of the specimens upon which this redescription and figures were based have been deposited in the British Museum (Natural History).

Acknowledgments.

Valuable advice from Dr. J. T. Salmon of the Victoria University College, Wellington, New Zealand, and also from Dr. O. W. Richards of Imperial College, is gratefully acknowledged.

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APPENDIX.

Since the completion of this paper a further record of *C. libyca* has been brought to my notice. Prof. J. R. Denis (*Bull. Sci. Bourgogne, Suppl. No.* 5, 1950) has described specimens of this species from Chalon-sur-Saône. His description differs from that given above in a few points. I should like to express my gratitude to Prof. Denis for sending me a copy of his paper and some of his specimens for comparison with my own.

Denis states, " il n'y a pratiquement pas de pigment sur les aires oculaires et les ommas forment des taches noires séparées." In this respect he agrees with Caroli, who stated that the eyes were in " machie oculari pochissimo pigmentate." This would appear to be different from the condition shown in my figs. 1 and 3. In unmounted specimens the eyes appear as separate blackish spots on a slightly pigmented ocular area as described by these authors, but in well-cleared specimens the contrast between the pigment of the eyes and that of the surrounding eye patch is less well marked. The explanation of this discrepancy is probably that in the uncleared or less completely cleared specimens the pigment of the ocular area is somewhat masked by the cuticle and that the masking by the transparent lens over the eye is only slight. The setae mentioned in the text above as being serrate would be better described, as Denis has done, as rugose. The latter author also stated " on ne remarque pas de dents latérales," but I have noticed lateral teeth on the claws in the specimens from both Devonshire and France.

Book Notice.

Citrus Entomology in the Middle East, with Special References to Egypt, Iran, Irak, Palestine, Syria, Turkey. By F. S. Bodenheimer. 4to. The Hague (Junk), 1951. Pp. xii + 663, 154 figs. Price £5 10*s*.

A compendium of the animal pests of citrus cultivation in the eastern Mediterranean. The introductory section reviews the history of citrus cultivation in Palestine and gives a survey of the animal community within citrus groves there. A zoogeographical and ecological survey of citrus pests is followed by a key for the recognition of them by the symptoms they produce.

The citrus pests of Palestine are then considered in detail by Orders of insects, with three chapters (more than half the entire volume) devoted to Hemiptera. The Scale Insects and Mealybugs, a group of great economic importance, are reviewed at length. There are keys and descriptions, but the text mainly abounds with detailed biological information about every stage and phase of life history, and with analysis of environmental factors such as temperature, humidity, solar radiation, rainfall, and so on.

There is a chapter on mites, and one on such pests as the Lemon Rat, the Hooded Crow and Starling, citrus root Nematodes, and snails. A final chapter deals with fumigation, spraying, other methods of control, and with administrative and legal problems.

DESCRIPTIONS OF THREE SPECIES OF *CULICOIDES* LATREILLE (DIPTERA : CERATOPOGONIDAE) NEW TO SCIENCE, TOGETHER WITH NOTES ON, AND A REVISED KEY TO THE BRITISH SPECIES OF THE *PULICARIS* AND *OBSOLETUS* GROUPS.

By J. A. Downes, A.R.C.S., B.Sc., and D. S. Kettle,[1] D.Sc.(Lond.)

(*Zoology Department, Glasgow University.*)

I. Introduction.

Since 1945 there have been a number of Scottish studies of the biting midges of the genus *Culicoides* Latreille, some directly concerned with problems of control, others of a more purely scientific nature but nevertheless essential to the development of control schemes. In the course of this work three new species have been found—all belonging to that section of the genus in which the third dark costal mark only partially covers the second radial cell of the wing (*see* Edwards, 1939*a* : 31). These are described below, and we take the opportunity of discussing further some of the other British species of the same section.

Among the important taxonomic features of the adult are the size, the colour pattern and trichiation of the wing, the thoracic markings, and the male terminalia. The length of the wing has been taken as an index of size. Usually the wings were removed, mounted flat on a slide in Euparal, and measured from the basal cross-vein to the tip. This measurement has then been increased by one-seventh to allow for the part of the wing proximal to the cross-vein. In a few cases (mainly British Museum specimens) the full wing length was measured on the intact insect and no adjustment made. The thoracic markings can be seen only in dry specimens, but the pigments and textures that produce them are not destroyed by alcohol and the markings reappear as soon as the surface of a specimen preserved in fluid is allowed to dry. The male terminalia have been cleared in lactic acid and mounted in Euparal for examination.

It will be evident that our collecting has been confined to Scotland (many areas) and to the south-west part of the county of Dorset.

The terminology, throughout, is that used by Edwards (1939). As in Edwards' work, all descriptions of the wings (other than the measurements) refer to the female sex only.

Within the section of the genus under consideration, at least two distinct "groups" can be recognised, and we shall arrange our treatment along these lines.

II. The *Culicoides obsoletus* Group.

Within the larger section of the genus containing all the forms in which the third dark costal mark covers only half of the second radial cell, two of the species considered by Edwards (1939)—*C. obsoletus* Mg. and *C. chiopterus* Mg. —lie somewhat apart from the others and may be brought together as the

[1] Entomologist to the Sub-Committee on Midge Control, A.C.M.R.S., Department of Health for Scotland.

"*obsoletus* group." They are distinguished by their small size, the faintness of the wing markings and by the restriction of the macrotrichia of the wing-membrane to an apical patch, though usually with a very few others lying distally in the medial and cubital areas. The system of blackish marks on the thorax, so prominent in the *C. pulicaris* group, is represented only by a faint brown shading.

Two of the new species also belong to this group, one of them, *C. scoticus*, being closely related to *C. obsoletus*, and the other, *C. pseudochiopterus*, nearer to *C. chiopterus*. The markings and trichiation of the wing are very similar in all four species, although, as Edwards (1939*a*) indicated, it is usually possible to separate *C. chiopterus* by these characters. Because of this similarity we usually confine ourselves to listing male insects only when indicating the distribution of a particular species ; for the descriptions of the females of *C. obsoletus* and *C. chiopterus* we have relied on specimens bred, together with males, from identified larvae. The male terminalia and the larvae are, however, abundantly distinct, and there can be no doubt as to the existence of four species in Britain. The diagnostic features of the terminalia are summarised in Table II, while the larvae and pupae are being described elsewhere by Kettle and Lawson (*in the press*).

Because of the similarity of the females, often the only sex represented in collections, and because the male terminalia have rarely been adequately examined, a large number of ill-defined names referable to the *C. obsoletus* group have accumulated. Nine such terms are listed by Edwards (1939*b* : 143) as synonyms of *C. obsoletus* Mg. It has not been possible to examine the specimens on which these are based, but Edwards' attribution of them to *C. obsoletus* Mg., in the restricted sense, is no doubt usually correct. A slide in the British Museum (Natural History) labelled ♂ *C. clavatus*, Thienemann 1922–478, Plon Holstein, Germany, is certainly a typical male *C. obsoletus*. Root and Hoffmann (1937) synonymize *C. sanguisugus* Coquillet, 1905, with *C. obsoletus* Mg. and give an excellent figure of the terminalia of the latter. We have had an opportunity, through the courtesy of Dr. Willis Wirth, of re-examining their material in the U.S. National Museum and fully agree with this conclusion. Nevertheless there still remain seven other ill-defined names, and it is possible that one or other of these might eventually have to be applied to the species here described as new.

(a) *C. obsoletus* Meigen.

♂. Wing : Length 1·46 ± 0·04 mm. (Table I).

♀. Wing : Length 1·28 ± 0·05 mm. (Table I). Usually there are one or more macrotrichia in cubital fork (10/12 = 83 per cent.) and in anal cell (8/12 = 67 per cent). These setae are additional to the row, occurring in all species, that runs along hind margin of wing just within the fringe. The row of macrotrichia along upper branch of cubital fork covers nearly the whole of vein (12/12 = 100 per cent.) and there are usually one or more macrotrichia on lower branch (10/12 = 83 per cent.).

♂ and ♀. Thorax : Ash grey in colour, often with faint paired lateral brown streaks.

In most species of *Culicoides* two kidney-shaped dark patches can be seen in the posterior half of the thorax (mesonotum) when it is illuminated from the front. They are not depressions, nor pigment spots (since they disappear when the light is overhead), but are probably areas of unusual surface texture. A

little further back is a median oval area of somewhat similar character. In *C. obsoletus* (and two of the following species), however, the kidney-shaped patches are more or less completely fused in the mid-dorsal line, and usually appear as a single median patch with a notch on the anterior border (fig. 1). Sometimes

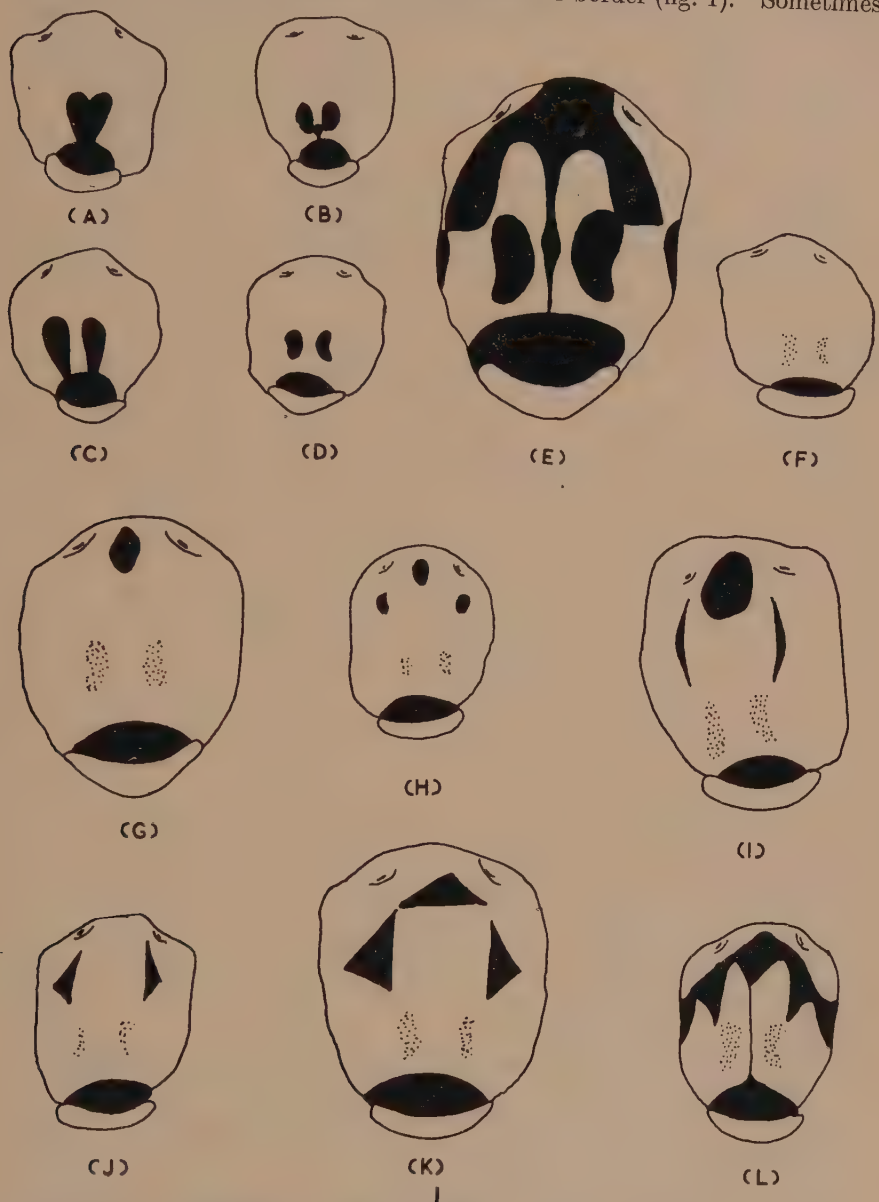


FIG. 1.—The thoracic markings of various *Culicoides*. (A) Usual pattern in *C. obsoletus*, *C. scoticus* and *C. chiopterus*. (B) Unusual pattern in same three species. (C) and (D) *C. pseudochiopterus*. (E) *C. lupicaris*. (F)–(J) *C. pulicaris*, (K) *C. pulicaris* and *C. punctatus*. (L) *C. punctatus*.

this fusion is not complete and the patches are separated by a thin pale line, always narrower than the width of one patch.

TABLE I.—*Wing length of various species of* Culicoides.

Species.	Sex.	Number of specimens.	Source of material.	Wing length in mm.	
				Mean and 95 per cent. fiducial limits.	Range.
C. obsoletus .	♂	13	12 bred from Glasgow area 1 collected in Glasgow	1·46 ± 0·04	1·36–1·55
	♀	12	All bred from Glasgow area	1·28 ± 0·05	1·10–1·45
C. scoticus .	♂	12	5 collected in Glasgow 7 „ in Inverness-shire	1·58 ± 0·06	1·39–1·71
	♀	No specimens available.			
C. chiopterus.	♂	14	8 bred from Glasgow area 1 „ „ Glen Clova 2 collected in Glasgow 3 „ „ Dorset	1·17 ± 0·04	0·96–1·32
	♀	12	8 bred from Glen Clova 4 „ Glasgow area	1·15 ± 0·03	1·04–1·24
C. obsoletus .	♂	13	12 bred from Glasgow area	1·46 ± 0·04	1·36–1·55
C. pseudo-chiopterus	♂	13	11 collected in Dorset 2 „ Glasgow area	1·32 ± 0·04	1·22–1·44
	♀	12	All collected in Dorset	1·23 ± 0·05	1·10–1·38
C. lupicaris .	♂	6	5 bred from Glasgow area 1 collected in Dorset	2·30 ± 0·14	2·12–2·46
	♀	10	7 bred from Glasgow area 1 in B.M. (Sutherlandshire) 2 collected in Dorset	2·17 ± 0·14	1·82–2·41
C. pulicaris .	♂	17	See Table III	2·06 ± 0·10	1·71–2·41
	♀	42	„ „	2·02 ± 0·06	1·43–2·29
C. punctatus .	♂	40	„ „	1·81 ± 0·05	1·50–2·14
	♀	26	„ „	1·83 ± 0·08	1·57–2·36

The male terminalia have been adequately described by Edwards (1939*b*), and are shown for purposes of comparison in fig. 2.

Females can be separated from those of *C. chiopterus* by the usually larger size and by the increased trichiation and denser markings of the wings; and from *C. pseudochiopterus* by the fused dark patch on the thorax. They are indistinguishable as yet from those of *C. scoticus*. Males are readily separable from all other species by the notched sternite and the characteristic aedeagus.

Specimens examined.—INVERNESS-SHIRE: Inverness, 1 ♂, 29.viii.1946; Auchteraw, Fort Augustus, 1 ♂, 12.ix.1948. ARGYLLSHIRE: Killundine, Morven, 2 ♂, 24.vi.1947. DUNBARTONSHIRE: Garelochhead, 1 ♂, 8.viii.1945; Bannachra Woods, Helensburgh, 68 ♂, 8.v.1948–15.ix.1948; Rossdhu Park, 1 ♂, July, 1947. STIRLINGSHIRE: Inchcailloch, Loch Lomond, 1 ♂, 29.v.1946. LANARKSHIRE: Glasgow, 3 ♂, 17.viii.1947. DUMFRIESSHIRE: Annan, 1 ♂, 22.viii.1945. DORSET: Chideock, 21 ♂, 13–27.vii.1946, 3 ♂, 10–21.vii.1948; Charmouth, 2 ♂, 17.vii.1946; Abbotsbury, 1 ♂, 22.vii.1946.

The larvae of *C. obsoletus* have been recorded from many breeding sites in and around Glasgow and Loch Lomond (*see* Kettle and Lawson—*in the press*). The species is very widespread and generally common in Britain.

(b) **C. scoticus** sp. n.

♂. Wing : Length 1·58 ± 0·06 mm. (Table I).

Thorax (fig. 1a) : Ash grey, usually with paired brown lateral streaks. In posterior half, as in *C. obsoletus*, a single central dark mark (13 ♂ examined).

Terminalia (Table II; fig. 3) : As in *C. obsoletus*, the tergite slightly convex with no trace of lateral processes. The sternite very characteristic, being completely divided in the mid-ventral line into two parts which converge posteriorly. Membrane bare. Coxite short and broad, as in *C. obsoletus*, but with a stouter ventral root. Tip of style enlarged. The parameres sharply angled at base (slightly more so than in *C. obsoletus*), and the bare tips are bent over ventrally.

The aedeagus supported, as in *C. obsoletus*, by a pair of angled lateral bars, which converge and fuse posteriorly ; at this point it carries a peg-like sclerotization projecting both forwards and backwards in the mid-line. Remainder of median part of aedeagus membranous. Both parts of peg larger than in *C. obsoletus*, the backwardly directed portion square-ended with rounded corners, unlike the curved margins meeting at a blunt point of *C. obsoletus*.

Males of *C. scoticus* can be recognised by the divided sternite and the characteristic shape of the aedeagus. The females have not as yet been separated from those of *C. obsoletus*.

TABLE II.—*Comparison of the male terminalia of the British members of the* C. obsoletus group.

	1. *C. obsoletus.*	2. *C. scoticus.*	3. *C. chiopterus.*	4. *C. pseudochiopterus.*
Tergite—margin	Slightly convex	Slightly convex	Slightly concave	Slightly convex
,, —processes	Absent	Absent	Short stumpy	Absent
Sternite	Median notch	Completely divided	Deeply emarginate	Deeply emarginate
Membrane	Bare	Bare	Bare	Bare
Coxite	Short and broad	Short and broad	Narrow	Narrow
,, ventral root	Slender	Stouter than 1	Slender	Slender
,, dorsal root	Short	Short	Longer than 1–2	Longer than 1–2
Style tip	Expanded	Expanded	Not expanded	Not expanded
Parameres—basal angle	Sharp	Sharper than 1	Gentle	Sharper than 3
,, —tip	Very occasionally feathered 1/11	No feathering	No feathering	No feathering
Aedeagus—apical projection	Rounded	Square cut	Elongate	Elongate but larger than 3
Aedeagus—area between lateral bars	Membranous	Membranous	Sclerotized posterior half only	Sclerotized almost entirely
Aedeagus—anterior transverse bar	Absent	Absent	Absent	Present

Holotype, ♂.—LANARKSHIRE : University Grounds, Glasgow, 17.viii.1947.

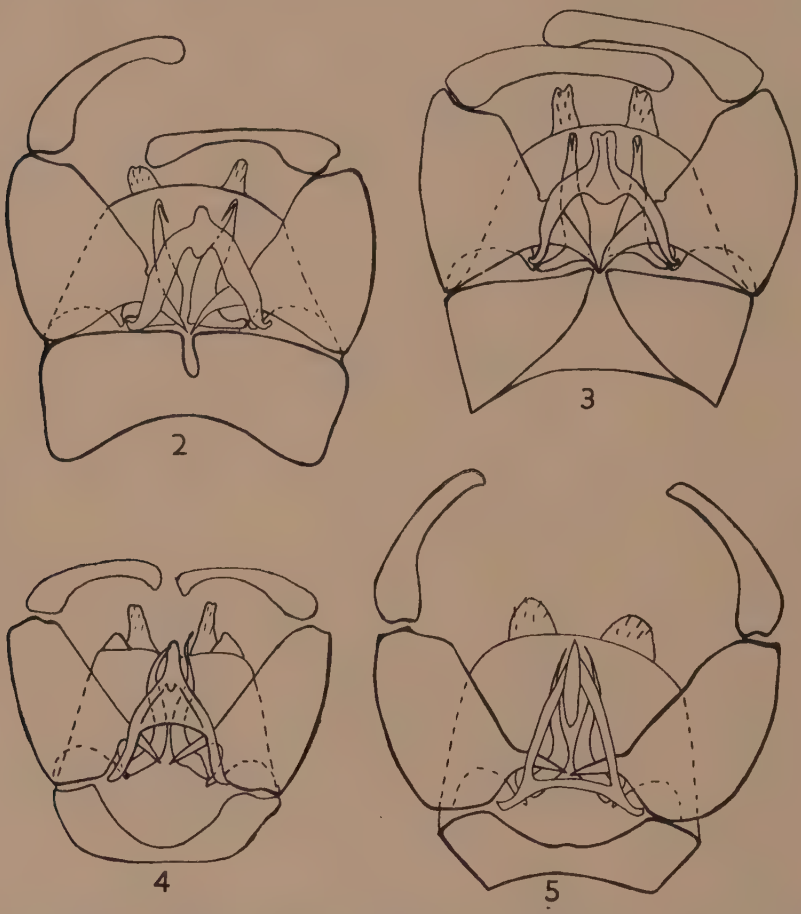
Paratypes.—LANARKSHIRE : Same locality as type, 2 ♂, 12.viii.1947. INVERNESS-SHIRE : Auchteraw, Fort Augustus, 1 ♂, 17.ix.1946 ; 2 ♂, emerged between 6.xii.1946 and 7.iii.1947 ; Inverness, 1 ♂, 29.viii.1946.

[2] *Other specimens.*—INVERNESS-SHIRE : Inverness, 1 ♂, 29.viii.1946 ; Auchteraw, Fort Augustus, 8 ♂, emerged between 6. xii.1946 and 7.iii.1947 ; 4 ♂, 12.ix.1948. STIRLINGSHIRE : Inchcailloch, Loch Lomond, 1 ♂, 30.v.1946.

[2] These specimens have been damaged or are not readily examined in detail, and for this reason are not treated as paratypes.

DUNBARTONSHIRE : Bannachra Woods, Helensburgh, 5 ♂, trapped between 8.v.1948 and 15.ix.1948. LANARKSHIRE : University Grounds, Glasgow, 2 ♂, 12.viii.1947.

The type and four paratypes have been deposited in the British Museum (Natural History), one paratype (Auchteraw, 17.ix.1946) in the U.S. National Museum, Washington, and one paratype (Inverness, 29.viii.1946) in the Canadian National Collection, Ottawa.



FIGS. 2–5.—Male terminalia of (2) *C. obsoletus*, (3) *C. scoticus* sp. n., (4) *C. chiopterus*, (5) *C. pseudochiopterus* sp. n.

(c) *C. chiopterus* Meigen.

♂. Wing : Length 1·17 ± 0·04 mm. (Table I).

♀. Wing : Length 1·15 ± 0·03 mm. (Table I). Wing markings fainter than in *C. obsoletus*, so that sometimes they appear merely whitish. Usually without macrotrichia in cubital fork (9/12 = 75 per cent.) or on anal area (11/12 = 92 per cent.) or lower branch of cubital fork (11/12 = 92 per cent.). The single row of macrotrichia on upper branch of fork covers no more than the distal one-half to two-thirds of vein (11/12 = 92 per cent.).

♂ and ♀. Thorax (fig. 1a) : Ash grey in colour, never with more than the slightest trace of darker lateral streaks. A single dark central patch in posterior half of thorax (much as in *C. obsoletus*) can be seen with front lighting (6 ♂, 8 ♀ examined).

♂. Terminalia : These have been adequately described by Edwards (1939*b*) and are illustrated in Fig. 4. (See also Table II.)

Females of *C. chiopterus* can usually be distinguished from the other members of the group by their small size and faintly marked wings with reduced trichiation in the cubital and anal areas. In addition they can be separated from *C. pseudochiopterus* by the single dark patch on the thorax. Males are readily recognised by the terminalia : the sternite is emarginate ; the coxite longer and the style less expanded distally than in *C. scoticus* and *C. obsoletus* ; the end of the tergite is concave and the aedeagus quite characteristic.

Specimens examined.—INVERNESS-SHIRE : Clachnaharrie, Inverness, 1 ♂, 31.viii.1946. ARGYLLSHIRE : Seil Island (near Oban), 1 ♂, 22.vi.1947. ANGUS : Braedownie, Glen Clova, 3 ♂, 8 ♀ bred from 15 larvae collected 19.viii.1950. DUNBARTONSHIRE : Bannachra Woods, Helensburgh, 1 ♂, 20.vi.1948. STIRLINGHSIRE : Inchcailloch, Loch Lomond, 3 ♂, 29.v.1946. LANARKSHIRE : University Grounds, Glasgow, 2 ♂, 17.viii.1947 ; Drumchapel, Glasgow, 252 larvae, 8.ii.1951. AYRSHIRE : Largs, 1 ♂, 26.v.1946. HERTFORDSHIRE : Rothamsted, Harpenden, 11 larvae collected between 7.ii.1950 and 21.iii.1950. DORSET : Chideock, 3 ♂, 22.vi.1946.

C. chiopterus is very widespread, and probably common, in Britain.

(d) **C. pseudochiopterus** sp. n.

♂. Wing : Length 1·32 ± 0·04 mm. (Table I).

♀. Wing : Length 1·23 ± 0·05 mm. (Table I). Wing markings more distinct than in *C. chiopterus* and resembling those of the two preceding species. There are often one or more macrotrichia within cubital fork (7/12 = 58 per cent.) and in anal cell (8/12 = 67 per cent.). Lower branch of cubital fork usually bare (11/12 = 92 per cent.)—the solitary anomalous individual carried only a single hair. The row of macrotrichia on upper branch usually covers the distal one-half to two-thirds of vein, but occasionally (2/12 = 17 per cent.) it covers nearly the whole.

♂ and ♀. Thorax (fig. 1c) : Ash grey, often with paired faint brown lateral streaks. In posterior half a pair of dark kidney-shaped patches are visible by front lighting ; the pale band separating them is at least as broad as one of the patches. In about half of the specimens examined (7/15 = 47 per cent.) these patches connected by a dark shade to the oval area previously mentioned.

♂. Terminalia (Table II, fig. 5) : Hind margin of tergite slightly convex and lateral processes absent. Sternite, as in *C. chiopterus*, deeply emarginate and membrane bare. Coxite long and narrow, again as in *C. chiopterus*, with a long slender ventral root which nearly meets its fellow in the mid-line. Tip of style hardly expanded, and obviously smaller than the enlarged base. Parameres bare at tip, which is turned inwards and forwards ; basal angle gentle, almost as in *C. chiopterus*. The aedeagus supported by a pair of nearly straight lateral bars, converging and fusing posteriorly. At this point it carries an elongate median structure, which runs backwards as a pointed peg and also forwards for a considerable distance ; the latter part appears to be the homologue of the small " dorsal tooth " of *C. chiopterus*. Nearly the whole median area of the aedeagus (i.e., much more than in *C. chiopterus*) lightly sclerotized and bounded anteriorly by a very evident sclerotized bar extending between bases of lateral arms.

Males and females of this species have not yet been associated by rearing from identified larvae. In both *C. obsoletus* and *C. chiopterus*, however, it has

been found by rearing that the sexes do not differ with regard to the patch(es) on the thorax (in these two species there is a fused median patch), and so it is reasonable to expect that *C. pseudochiopterus* also will not show sexual dimorphism in this respect. At Chideock, Dorset, where *C. pseudochiopterus* occurs in association with the other two species, an examination of the males shows that it forms about half of the total *obsoletus*-group population (27/58 = 46 per cent.). Among the females slightly more than half (31/51 = 61 per cent.) have widely separated kidney-shaped patches, and we have assumed in the foregoing description that these are the females of *C. pseudochiopterus*.

Both sexes of *C. pseudochiopterus* can be separated from other members of the *obsoletus*-group by the paired kidney-shaped marks on the thorax. The males can be distinguished from all other species by the form of the aedeagus; the convex tergite serves further to separate it from *C. chiopterus* and the emarginate sternite and long coxite from *C. obsoletus* and *C. scoticus*.

Holotype, ♂.—Lanarkshire: University Grounds, Glasgow, 17.viii.1947.

Allotype, ♀.—Dorset: Chideock, 10.vii.1946.

Paratypes.—Dorset: Chideock, 16 ♂, 12 ♀, 10–27.vii.1946; Charmouth, 2 ♂, 22 ♀, 11–26.vii.1946; Abbotsbury, 4 ♀, 22–24.vii.1946. Devon: Axminster, 1 ♂, 19.vii.1946. Stirlingshire: Lochan Dubh, Loch Lomond, 1 ♂, 20.v.1946.

Other specimens.—Inverness-shire: Clachnaharrie, Inverness, 1 ♂, 31.viii.1946. Angus: Braedownie, Glen Clova, 2 ♂ bred from 3 larvae collected 18.viii.1950. Dunbartonshire: Bannachra Woods, Helensburgh, 8 ♂ trapped between 10.v.1948 and 15.ix.1948. Lanarkshire: University Grounds, Glasgow, 1 ♂, 12.viii.1947; Drumchapel, Glasgow, 2 larvae, 16.ii.1951. Hertfordshire: Rothamsted, Harpenden, 12 larvae collected between 7.ii.1950 and 21.iii.1950. Dorset: Chideock, 1 ♂, 18 ♀, 10–27.vii.1946; Charmouth, 2 ♂, 1 ♀, 11–17.vii.1946.

The type, allotype and 10 ♂, 30 ♀ paratypes have been deposited in the British Museum (Natural History). 4 ♂, 4 ♀ paratypes from Chideock have been deposited in the U.S. National Museum, Washington, and 2 ♂, 4 ♀ paratypes from Chideock and 2 ♂ paratypes from Charmouth in the Canadian National Collection, Ottawa.

III. The *Culicoides pulicaris* Group.

The other well-defined group among the British species of the same section of the genus consists of a number of species closely related to *C. pulicaris* L. The wing markings, while of the same general type as in the preceding group, are heavier, and the trichiation much more extensive and covering the distal two-thirds of the wing (including most of the anal area). There is a frequent tendency to the development of a spot in the cubital fork. The mesothorax of most species is marked with a system of blackish pigment spots. The male terminalia of all species have a slightly emarginate sternite; a tergite with distinct but, for the genus as a whole, small apical processes; an aedeagus consisting mainly of two sclerotized bars fusing posteriorly; a coxite with a distinct group of strong bristles, often on a projection, on the inner margin, and feathered parameres.

Before 1926 all British specimens of this group would presumably have

been determined as *C. pulicaris* L. In that year Edwards introduced *C. impunctatus* Goet. into the list (under the name of *C. arcuatus* Winn.), and distinguished in *C. pulicaris* four varieties, *a–d*. Two of these were later (1939*a*) raised to specific rank as *C. halophilus* Kieffer and *C. delta* Edwards (the latter name merely referring to the fact that it was his variety *d* of 1926). Varieties *a* and *b* remained as two rather distinct varieties of *C. pulicaris* L., the type form and var. *punctatus* Meigen (= *ocellaris* Kieffer). The four forms distinguished within *C. pulicaris sens. lat.* are very closely related and there are no decisive differences in the terminalia of the males. *C. impunctatus*, however, is more distinct, and the male terminalia are easily recognisable ; black thoracic markings are absent and there is usually no spot in the cubital fork.

There is every reason to approve of Edwards' distinctions. *C. halophilus* is, as he points out, easily recognisable by the markings on the wing ; and also, it may be added, by the details of the heavy thoracic pigmentation. It is characteristic of coastal marshes and appears to be rather common in such areas : we have collected it in Dorset (Abbotsbury) and in many Scottish localities. *C. delta* is another species with heavy thoracic markings, but it differs from all the other forms removed from *C. pulicaris* in lacking a spot within the cubital fork (*see* Edwards, 1939*a*, fig. 18). Edwards' figure also shows that in the anal area of the wing the longitudinal dark marking runs along the hind margin, and does not rise upwards as it approaches the lower branch of the cubital fork ; whereas in the two " varieties " of *C. pulicaris* and in *C. halophilus* (*loc. cit.*, figs. 15–17) this shading is separated slightly from the hind margin by a paler area, except in very heavily marked individuals, and then rises up still more on approaching the vein, before reaching which it ends in a rounded patch that is often rather more heavily pigmented. *C. delta* also has a characteristic season of appearance. The larva, however, is not as yet distinguishable from that of *C. pulicaris sensu stricto* (*see* below and also Kettle and Lawson, *in the press*). The species is widespread and not uncommon in Scotland, but has not been recognised with certainty elsewhere. In the account which follows we propose to extend the clarification introduced by Edwards by elevating the two " varieties," *C. pulicaris pulicaris* and *C. p. punctatus*, to specific rank, and by describing yet another new species, *C. lupicaris*, from within this complex.

It may be mentioned here that, in addition to the members of the *C. obsoletus* and *C. pulicaris* groups, as defined above, there are two more British species with the second radial cell partly pale. These are *C. grisescens* Edwards and *C. fagineus* Edwards, both of which were treated by that author (1939*b*) as belonging to the *C. pulicaris* group. The male terminalia, however, differ considerably from the type defined above, and as there are a number of closely related forms known from outside Britain, it seems best to separate them as the nucleus of another "group."

(a) *C. pulicaris* L. *sensu stricto* (= *C. pulicaris* L. typical form of Edwards, 1939).

♂. Wing : Length, 2·06 ± 0·10 mm. (Table I).
♀. Wing : Length, 2·02 ± 0·06 mm. (Table I).

It is sufficient here to comment on the distinguishing features of this well-known form.

Wings of female (Edwards, 1939*a*, fig. 15) with second dark costal mark having an approximately vertical outer margin, so that the mark is not conspicuously widened at any particular level. Third costal spot hourglass-shaped and broadest in fold of wing just above vein M_1. Tips of M_1 and M_2 dark, being covered by the continuation of the dark shade along the veins. In anal area the longitudinal dark mark usually distinctly separated from wing margin along its entire length (even in the most heavily marked specimens this separation is evident, at least at each end of the mark), and as it approaches lower branch of cubital fork it rises upwards and ends in a rounded, usually more heavily pigmented patch just before reaching the vein. A spot always present within cubital fork. The wing markings subject to much variation in extent, but even when exceptionally enlarged or reduced the foregoing distinctive features of the pattern usually evident. The tint of the whitish ground-colour and sharpness of margins of dark markings also vary.

Dark markings of mesonotum (see also below) usually reduced and sometimes obsolescent. The larva and pupa distinguishable from those of all other members of the complex except *C. delta*.

The species is common and widespread in Britain, usually occurring in company with *C. punctatus*.

C. pulicaris can be separated from *C. punctatus* by the character of the second and third costal marks and of the tips of M_1 and M_2; from *C. halophilus* by the same features and by the other points mentioned by Edwards (1939*a*); from *C. lupicaris* by the form of the mark in the anal area and from *C. delta* by the same feature and by the presence of the spot in the cubital fork. It has the least heavily marked thorax. Males can usually be distinguished along the same lines as the females, but the terminalia present no evident points of difference.

Distribution.—It probably occurs in almost all areas of Britain. In the British Museum there is a long series, in the main correctly separated by Edwards, though treated as a variety only, from the following counties; Middlesex, Herts., Essex, Notts., Cheshire, Shropshire, Yorkshire, Glamorgan, Ayr and Bute (Arran). We have found it in many Scottish localities in the counties of Renfrew, Lanark, Dunbarton, Stirling, Argyll, Inverness, Ross and Cromarty and Sutherland; it is also abundant in Dorset and we have seen specimens from Belfast (Co. Down).

(b) *C. punctatus* Meigen (= *C. pulicaris* var. *punctatus* Mg. of Edwards, 1939).

♂. Wing: Length 1·81 ± 0·05 mm. (Table I).
♀. Wing: Length 1·83 ± 0·08 mm. (Table I).

Here again only the distinguishing features will be noted.

Wings of female (Edwards, 1939*a*, fig. 16) with lower part of second costal mark greatly extended outwards, so as to underly, more or less completely, second radial cell. The third costal mark similarly extended, above fold, into a distinct prolongation, and conspicuously widest at this level. The dark markings along veins M_1 and M_2 separate before reaching wing margin, so as to leave apices of veins pale. In cubital and anal areas no differences from *C. pulicaris*. Also, as in that species, there is variation in the extent of wing markings (though here again the significant elements of the pattern remain evident in all forms), tint of wings and in sharpness of the markings.

The mesonotal markings (see also below) well developed and show much less variation than in *C. pulicaris*: they are as heavy as, or slightly heavier than, in the most heavily marked specimens of the normal range of that species. The larva and pupa distinguishable from those of all other members of the complex.

C. punctatus can be distinguished from *C. pulicaris* by the shape of the second and third costal marks and by the pale tips of M_1 and M_2 ; the same features also separate it from *C. lupicaris* and *C. delta*, from which it differs further in the character of the marking in the anal area, and, in the case of *C. delta*, by having a spot in the cubital fork. *C. punctatus* is evidently closely allied to *C. halophilus*, which shares with it the special features of the second and third costal markings and the pale areas at the tips of M_1 and M_2 (*see* Edwards, 1939*a*, fig. 17). The wings of *C. halophilus* are, however, much more heavily and diffusely marked and, in particular, a dark shade extends into the basal part of the median fork so that, in Edwards' terminology, there are two spots in this fork. *C. punctatus* is the smallest member of the *C. pulicaris* complex. The thoracic markings are heavier than in normal *C. pulicaris*, but less extensive than in *C. delta* or *C. lupicaris*.

Distribution.—The species is common and widespread and probably occurs almost throughout Britain. The British Museum specimens come from the following counties: London, Middlesex, Herts., Cambs., Surrey, Berks., Hants., Devon, Cornwall, Glamorgan, Westmorland and Bute (Arran). We have found it commonly in Ayr, Renfrew, Dunbarton, Stirling, Argyll, Perth, Inverness and Ross and Cromarty ; also in Dorset.

(c) Discussion of *C. pulicaris* and *C. punctatus* (with notes on *C. delta*).

There are a few specimens of " intermediate " character which are difficult to assign to one or other of the closely related species *C. pulicaris* and *C. punctatus*. This fact, which probably accounts for Edwards treating them merely as varieties, justifies some further observations.

(*i*) *Adults.*—We have examined many specimens of both species, from three main sources: (i) bred from larvae, Scotland ; (ii) collected as adults, Scotland ; (iii) the British Museum collection, mostly from England. The results are shown in Table III, except for one series in the British Museum (bred by J. E. Collin) which will be considered separately.

The considerable range of variation in the thoracic markings has already been mentioned. It is possible to arrange the specimens in the series shown in fig. 1, f–l, proceeding from the plainest to the most heavily marked: (f) uniformly grey thorax, (g) a small dark rounded spot, situated anteriorly, (h) three small round spots arranged in a triangle, (i) a large median spot and two posteriorly directed narrow streaks, (j) two lateral dark triangular patches, (k) as in (j) with an additional anterior triangular patch, (l) as in (k) but the patches enlarged and united at their angles.

Examination of Table III shows that specimens with a *pulicaris* wing pattern have a normal range from type (f) to type (k). Those with a *punctatus* wing pattern almost all fall into types (k) and (l), mainly the latter. There are also in the British Museum collection, however, two specimens—not listed in Table III—with thoracic markings even heavier than type (k) and resembling rather those of *C. delta* or *C. lupicaris* ; curiously enough both belong, on wing characters, to *C. pulicaris*.

With regard to the wing markings, almost all specimens fall decisively into the one or the other type, but 5/130 (= 4 per cent.) had markings of an intermediate character. Of those with the wing pattern of *C. pulicaris* 4/49 (= 7 per

TABLE III.—*Analysis of characters of adult male and female* C. pulicaris *and* C. punctatus *from three different sources. The separation was based upon the shape of the third costal dark spot.*

Source of material.	Species.	Sex.	No.	Wing length in mm.	Wing: Third costal spot broadest: On fold.	Wing: Third costal spot broadest: Above fold.	Wing: Pale tips to veins: M_1.	Wing: Pale tips to veins: M_2.	Thorax markings as in Fig.: 1f.	1g.	1h.	1i.	1j.	1k.	1l.
Bred 1948 to 1950	*pulicaris*	♂	5	1·92±0·14	5	.	.	.	1	1	1	1	1	.	.
	,,	♀	14	1·84±0·05	14	.	1	.	3	2	2	1	1	4	1
	punctatus	♂	4	1·71±0·21	.	4	4	4	.	.	.	.	.	1	3
		♀	1	1·71	.	1	1	1	.	.	.	.	.	.	1
	? *punctatus*	♀	1	.	=		1	.	.	.	.	.	.	1	.
	?	♂	1	.	=		.	.	.	.	.	.	.	1	.
Collected 1948 to 1950	*pulicaris*	♂	3	2·29±0·35	3	.	.	.	1	1	.	1	.	.	.
	,,	♀	10	2·22±0·12	10	.	.	.	3	1	2	3	.	.	1
	punctatus	♂	19	1·84±0·09	.	19	14	17	.	.	.	.	.	1	18
	,,	♀	7	1·91±0·09	.	7	6	6	.	.	.	1	.	1	5
	? *pulicaris*	♀	1	.	=		.	.	.	1	.	.	.	.	.
	? *punctatus*	♂	1	.	=		.	1	.	.	.	.	.	.	1
British Museum collection	*pulicaris*	♂	9	2·06±0·14	9	.	.	.	1	5	1	.	.	2	.
	,,	♀	18	2·04±0·09	18	.	.	1	7	3	2	4	.	.	2
	punctatus	♂	17	1·80±0·08	.	17	14	14	.	.	.	.	.	.	17
	,,	♀	18	1·81±0·11	.	18	18	18	1	.	.	2	.	5	10
	? *pulicaris*	♀	1	.	=		.	.	.	1	.	.	.	.	.

cent.) had thoracic markings typical of *C. punctatus*, and of those with *C. punctatus* wing pattern, 4/67 (= 6 per cent.) had the thoracic markings of *C. pulicaris*. These combinations appeared in all sources of material. In all 13/130 (= 10 per cent.) specimens had mixed characters. It is felt that this is a maximum figure, and that some could be determined on further study. In particular the thoracic markings of *C. punctatus* tend to have sharply angled margins, whilst those of *C. pulicaris* are rounded. Nevertheless, there may always be some whose identity is doubtful. It is evident, however, that the two distinctions are rather highly correlated. The statistical difference in size has already been indicated.

(*ii*) *Early stages.*—The larvae of *C. pulicaris* and *C. punctatus* are similar but, taken together, show a wide range of variation. The forms of thoracic pigmentation are being described elsewhere by Kettle and Lawson (*in the press*) and it is sufficient to state here that the whole range occurs in each species. The head lengths are shown in fig. 6, where these two species are compared with *C. impunctatus*; to facilitate the comparison the means of the two distributions (*C. pulicaris* + *C. punctatus*, against *C. impunctatus*) have been aligned. It is clear that the range in *C. impunctatus* is far smaller—217–259μ (= 42μ) as against 221–287μ (= 66μ) for the other two species together.[3]

The larvae of *C. pulicaris* and *C. punctatus* were then separated into two groups with head lengths of 246μ and more (= 60 micrometer divisions) and 242μ and less (= 59 micrometer divisions). Rather surprisingly this arbitrary

[3] Some *pulicaris*-type larvae with a head length of 299μ have recently been found, but as no adults have been bred they are not included here.

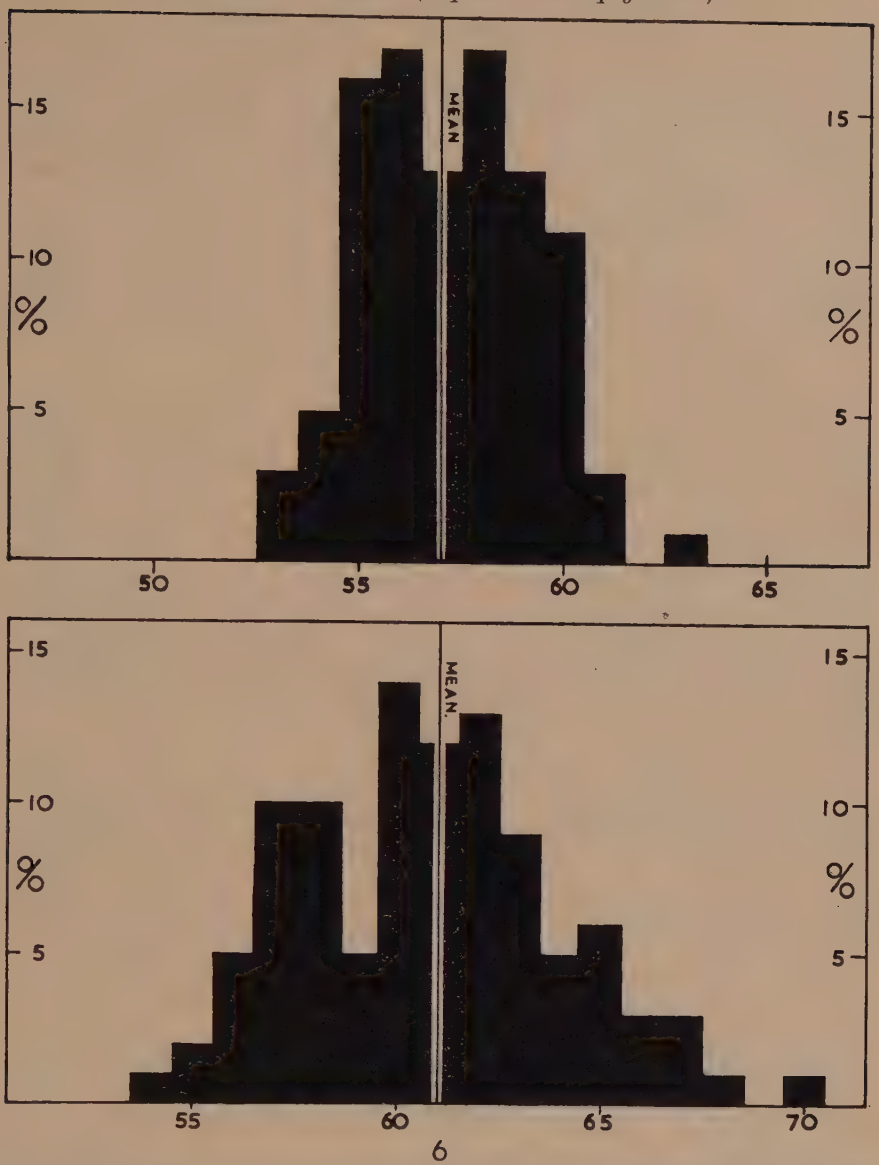


FIG. 6.—Percentage frequency distributions of the larval head length of *C. impunctatus* (upper histogram 105 larvae) and *C. pulicaris* + *C. punctatus* (lower histogram 152 larvae). Abscissa-head length in micrometer eyepiece divisions (1 division = 4·1μ). The two histograms are aligned so that the means coincide.

division gave an almost complete separation of the two species. On the other hand, no separation was achieved between *C. pulicaris* and *C. delta*. On one occasion four apparently identical larvae yielded two adult females, 1 *C. delta* and 1 *C. pulicaris*, and on another 5 larvae yielded 2 ♂ 1 ♀ *C. pulicaris* and 1 ♂ *C. delta*. It is possible that the great range in head size of "*C. pulicaris*" is in part due to this admixture of *C. delta*.

TABLE IV.—*Frequency distributions of head length of various collections of apparently identical larvae and the identity of the adults to which they gave rise.*

Collection.	Head length in micrometer divisions (1 div. = 4·1)μ.																		*punctatus.*	*pulicaris.*	*delta.*
	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
1950*b*	1	3	7	15	14	3	.	.	.	.	.	.	.	.	.	.	.	.	4♂, 1♀	.	.
1948	.	.	.	1	2	2	.	1	2	.	.	.	.	.	.	.	.	.	1♀	.	.
1950*c*	.	.	.	.	.	2	20	14	12	10	4	3	.	.	.	.	.	.	.	3♂, 6♀	.
1950*a*	.	.	.	.	.	1	1	2	6	4	3	4	3	2	2	.	1	.	.	2♂, 6♀	1♀
1949	.	.	.	.	.	.	.	1*	.	.	.	3	1	2	.	.	.	.	.	2♀	1♀
1951*b*	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.	2♀
1951*a*	.	.	.	.	.	.	.	.	.	.	.	3	.	.	1	.	1	.	.	2♂, 1♀	1♂
1951*c*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	.	.	2♀

* Reared to *C. pulicaris.*

The pupae of *C. pulicaris* and *C. punctatus* can be distinguished (Kettle and Lawson, *in the press*), but here again no differences between *C. pulicaris* and *C. delta* have been discovered.

(*iii*) *Distribution and habits.*—During 1948 weekly collections of midges were made at Bannachra and Wester Bannachra near Loch Lomond (Kettle, 1949), and the findings for *C. pulicaris*, *C. punctatus* and *C. delta* are given in fig. 7. Although observations did not begin until all three species were on the wing, the following conclusions can be drawn: (1) that *C. delta* is abundant only in the spring and is absent after the end of July, (2) that *C. pulicaris* and *C. punctatus* have seasonal distributions with two periods of abundance, one in the spring and a smaller one in the summer. The two latter species continue to occur in small numbers until early October.

It has already been mentioned that the adults of the two abundant species, *C. pulicaris* and *C. punctatus*, usually occur together on the same ground. Nevertheless if such a ground is sampled it is found that except in the very wet

TABLE V.—*Numbers of* C. pulicaris *and* C. punctatus *larvae in various soil samples. Each sample consists of* 3*-in. diameter cores* 2 *in. deep.*

Collection	Number of samples.	Date.	*pulicaris.*	*punctatus.*	Per cent. *pulicaris.*
Balmaha 1	9	6.viii.1949	1	.	.
,,	18	3. iv .1950	12	.	100
,,	18	7. vi .1950	6	.	100
D/1	9	22. ii .1950	1	14	7
D/2	5	14. iii .1950	5	.	100
,,	10	19. iv .1950	3	.	100
,,	8	16. v .1950	5	.	100
D_3/A	11	13. iii .1950	.	5	0
D_3/B	4	22. iii .1950	.	16	0
D_3/C	4	14. iii .1950	1	4	20
D_3/D*	*	20. vi .1950	33	27	55
D_3/E*	*	20. vi .1950	1	.	.
M/1	9	1. iii .1950	.	3	0
M/3	10	6. iii .1950	3	8	27
,,*	*	12. vi .1950	4	9	31
,,*	*	20. vi .1950	28	11	72
Total			103	97	52

* Too wet to sample quantitatively.

areas the larvae of the two forms are independently distributed. (*See* Table V. On grouped data $P<0{\cdot}001$.) Since the eggs are laid in batches of 50–100, this is a strong indication that the forms breed true and that mixed families do not occur. It may be supposed that the very wet areas which yield both forms allow a significant degree of larval migration. At all events it is clear that the two forms are not uniformly distributed over the same breeding-ground.

Like other *Culicoides*, the males are sometimes found flying in small swarms, but as they are often 10–20 ft. above the ground it is difficult to capture a large number of specimens. Samples of four separate swarms have been examined : two from Glasgow University grounds (where *C. pulicaris* and *C.*

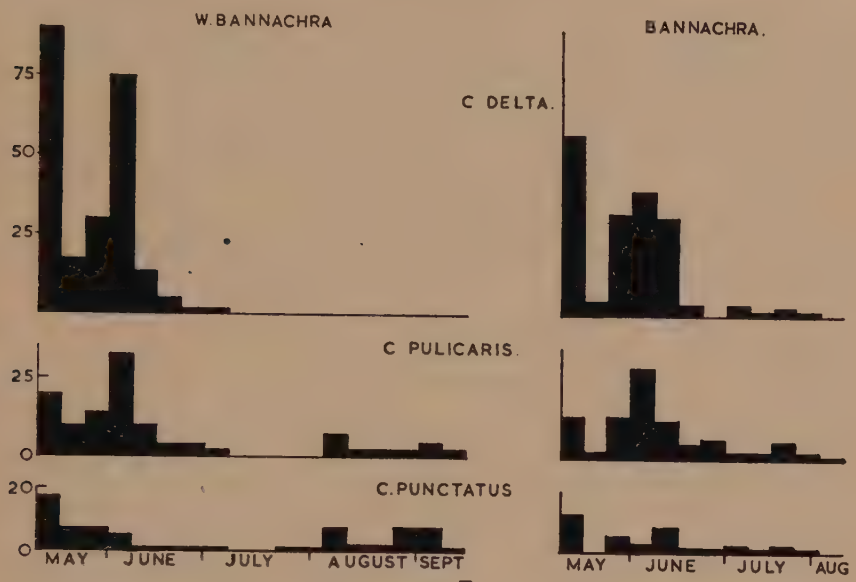


FIG. 7.—Seasonal distribution of *C. delta*, *C. pulicaris* and *C. punctatus*.

punctatus occur) consisted of 10 ♂ *C. pulicaris* and 16 ♂ *C. pulicaris* respectively ; while at Bannachra (where *C. pulicaris*, *C. punctatus* and *C. delta* are found) one swarm yielded 10 ♂ *C. delta* and another 3 ♂ *C. punctatus*. It seems that the three forms swarm separately even when occurring on the same ground.

A Note on the B.M. Specimens reared by J. E. Collin.

Edwards (1939*b* : 148) refers to a variety (?) of *C. pulicaris* reared from a rot hole in a beech tree near Lyndhurst, Hants. We have examined the series of 20 specimens now in the B.M. collection. They are rather small, brightly marked specimens, with wing markings corresponding to the description of *C. pulicaris* but perhaps of not quite the normal shape : in these features they are remarkably alike. Oddly enough, however, the series can be divided into two parts, 9 ♀ having a wing length of $1{\cdot}63 \pm 0{\cdot}05$ mm. and the thorax virtually unmarked, while 5 ♂ and 5 ♀ have a wing length of $1{\cdot}48 \pm 0{\cdot}06$ mm. with a

very heavily marked thorax like that of *C. delta* or *C. lupicaris* (one specimen is difficult to examine). The first group, though rather small, could be considered as *C. pulicaris*; the latter, however, have a thorax quite outside the normal range of this species. Like Edwards, we prefer to consider their identity an unsettled question.

Summary for C. pulicaris, C. punctatus *and* C. delta.

It emerges from this discussion that the high degree of distinctness in wing pattern between *C. pulicaris* and *C. punctatus* is correlated with a considerable difference in the thoracic markings and a statistically significant difference in size. The larvae and pupae can similarly be almost completely separated by minor structural features. Though they occur on the same ground at the same seasons, the distribution of the larvae in the soil and the swarming habits of the males indicate very strongly that the two populations do not mix. It is reasonable therefore to consider these forms as distinct species.

It also emerges that there are biological as well as anatomical facts confirming Edwards' treatment of *C. delta* as a distinct species.

(d) **C. lupicaris** sp. n.

A large species of the *C. pulicaris* group with conspicuous thoracic markings, closely allied to *C. pulicaris* and *C. delta*.

♂. Wing: Length, 2·30 ± 0·14 mm. (Table I).

♀. Wing: Length, 2·17 ± 0·14 mm. (Table I; fig. 8).

The second costal spot not prolonged under second radial cell, and third spot hourglass-shaped and widest on fold of wing above M_1. Apices of M_1 and M_2 dark, being included in the dark area that extends along these veins. A well-marked dark spot in cubital fork. In all these features and in general colour of wing, trichiation, and intensity and definition of markings, very like *C. pulicaris*. In anal region the longitudinal shade lies almost or quite along the hind margin, and does not rise up away from the margin or become more heavily pigmented on approaching cubital vein. Extent of wing markings varies considerably but not, in the few known specimens, to the same degree as in *C. pulicaris* or *C. punctatus*.

Mesonotum with a large blackish tridentate mark (fig. 1e) consisting of two broad lateral bands and a shorter central stripe which is pointed posteriorly; from this point a thin line of pigment runs backwards almost to hind margin of thorax. Anteriorly the thoracic mark extends as a broad band filling the area between the humeral pits. The paired kidney-shaped marks conspicuous.

♂. Terminalia: Tergite bearing short, backwardly directed apical processes. Sternite slightly emarginate and membrane bare. Coxite short and broad, with an area of stronger bristles on a slight projection of inner margin. The ventral root very short. Parameres sharply angled at base and with feathered tips. The aedeagus consists of a pair of stout bars fusing to form a backwardly directed projection, and so forming an arch: anterior margin indistinct. In all these points it resembles the other members of the *C. pulicaris* complex.

The larva and pupa can be distinguished from the related species and are being described by Kettle and Lawson (*in press*).

At Drumchapel, *C. lupicaris*, *C. pulicaris* and *C. punctatus* occur in the same field; and adults of all three species can similarly be taken together at Chideock. The breeding-ground of *C. lupicaris* at Drumchapel is, however, a distinct marshy area separated by a few yards from that of the other two species.

C. lupicaris is close to *C. pulicaris*, from which it differs in its larger size,

heavier thoracic markings and the characteristics of the anal area of the wing. It differs from *C. delta* principally in having a spot within the cubital fork, but resembles it closely in thoracic marking and in the anal area. It clearly differs from *C. punctatus* and *C. halophilus* in many wing characters, in size, and in the size or shape of the thoracic markings.

Holotype, ♀.—LANARKSHIRE : Drumchapel, Glasgow, bred from larva on 16.iii.1951.

Allotype, ♂.—Same locality as type, bred from larva on 22.iii.1951.

Paratypes.—Same locality as type, 1 ♂, 3 ♀ bred from larvae during March and April, 1951 ; 3 ♂, 3 ♀ bred from larvae during April and May, 1950.

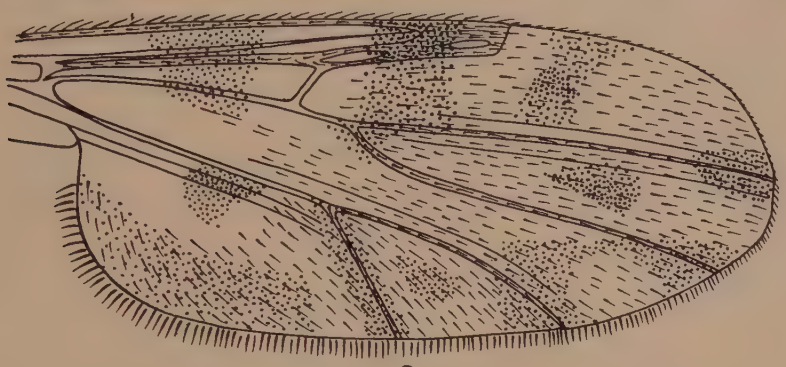


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FIG. 8.—*Culicoides lupicaris* sp. n. Wing of ♀.

Other specimens.—SUTHERLANDSHIRE : Loch Assynt, 1 ♀, 5.vi.1912, taken "red-handed" by Lt.-Col. Yerbury (specimen in British Museum). STIRLINGSHIRE : Balmaha, Loch Lomond, 1 larva, 14.iv.1951. DUNBARTONSHIRE : Milngavie, Glasgow, 2 larvae 23.ii.1951 ; 1 larva 20.iv.1950. DORSET : Chideock, 1 ♀, 21.vii.1948 ; 1 ♂, 16.iv.1949 ; 1 ♂, 15.iv.1951.

The species seems to be widespread but relatively scarce.

The type, allotype and 2 ♂, 4 ♀ paratypes have been deposited in the British Museum (Natural History). 1 ♂, 1 ♀ paratypes have been deposited in the U.S. National Museum, Washington, and the Canadian National Collection, Ottawa.

IV. REVISION OF EDWARDS' KEY TO THE BRITISH *Culicoides*.

When Edwards (1939*a*) wrote his key to the British species of *Culicoides* (females) he knew of only six species in the section of the genus in which the second radial cell is mainly pale. He later described two new species, *C. fagineus* and *C. grisescens*, and in this paper we have added three more and elevated *C. punctatus* to specific rank. It is therefore necessary to revise this section of his key, beginning at couplet 21 (p. 31), as follows :

21. Wings bare except at tip 22
Wings hairy on the distal half or more 24
22. Paired kidney-shaped thoracic markings widely separated **pseudochiopterus** sp. n.
Kidney-shaped thoracic markings fused or very close together . . 23

23. Smaller (wing length 1·00 to 1·25 mm.), markings faint, macrotrichia rare in both cubital fork and anal cell . . . . . **chiopterus** Mg.
    Larger (wing length 1·10–1·45 mm.), markings distinct, usually one or more macrotrichia in both cubital fork and anal cell . . **obsoletus** Mg.
24. A small dark spot in the cubital fork 25
    No dark spot in cubital fork 28
25. Third costal spot widest above fold, tips of M_1 and M_2 pale . . . 26
    Third costal spot widest on fold, tips of M_1 and M_2 dark 27
26. Two dark marks in median fork, one near base . . . **halophilus** Kieff.
    One dark mark in median fork, towards tip . . . . . **punctatus** Mg.
27. Thoracic markings very obvious and heavy, anal cell with dark shade along hind margin, larger (about 2·2 mm.) . . . . . **lupicaris** sp. n.
    Thoracic markings absent or poorly developed, anal cell with dark shade curving away from hind margin, smaller (about 2·0 mm.) . **pulicaris** L.
28. Larger (wing length about 2 mm.) 29
    Smaller (wing length about 1·5 m.m.) 30
29. Wing markings faint, thorax usually unmarked . . . . **grisescens** Edw.
    Wing markings distinct, thoracic markings obvious . . . . **delta** Edw.
30. Thorax unmarked . . . . . **impunctatus** Goet.
    Thorax marked . . . . . **fagineus** Edw.

(*C. scoticus* is omitted as the female has not yet been distinguished. It will almost certainly key down to *C. obsoletus*.)

Summary.

Three species of *Culicoides* new to science, *C. scoticus*, *C. pseudochiopterus*, and *C. lupicaris*, are described, and *C. punctatus* Mg. is elevated again to specific rank. The first two are members of the *C. obsoletus* group, and all four British species of the group are reviewed. *C. lupicaris* and *C. punctatus* belong to the *C. pulicaris* group, and again all British species of the group are commented on. The validity of the closely related species of the "*pulicaris*-complex" is discussed in the light of the anatomy of the adult and of the early stages, and of the seasonal and spatial distribution. Edwards' key to the British *Culicoides* is revised so as to include six additional species.

Acknowledgments.

Our thanks are due to Sir Harold Bowden, Bt., for financial assistance, and to Professor C. M. Yonge, F.R.S., for the facilities of the Zoology Department, University of Glasgow. We also wish to acknowledge the courtesy of Mr. Paul Freeman in making available the collections at the British Museum.

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A COMPARATIVE STUDY OF THE TWO FORMS OF *PHLEBOTOMUS ANTENNATUS* NEWSTEAD (DIPTERA, PSYCHODIDAE) FROM HYDERABAD, INDIA, AND N.W.F.P., PAKISTAN, RESPECTIVELY.

By M. Qutubuddin, M.Sc.

(*Malaria Institute of Pakistan.*)

Introduction.

During a survey in Hyderabad State, the author (1944) collected specimens of this species which answer to Sinton's (1933) description of the form occurring in other parts of the Indo-Pakistan sub-continent, but constantly differ from it in certain characters, such as the greater length of the third antennal segment and, in the males, in the relative measurements of the parts of the body. This paper is inspired by the desire to record these differences on the one hand and to fill the lacuna which exists owing to the absence of an adequate description of Indian forms on the other, so that a detailed description of the various forms occurring in the Indo-Pakistan sub-continent be made available for comparison with those of the Ethiopian Region.

In this paper the males and females from Hyderabad State, which will be referred to as the *deccan* form, and also the males from N.W.F.P., called the type form, have been described.

Deccan form. Female: *Antenna:* Segment III (0·099–0·1 mm., or 99–100μ) < IV + V (0·132 mm. or 132μ), shorter than epipharynx (AIII/E = 0·75); formula 2/III–XV. *Palp:* Formula 1, 2, 3, 4, 5; relative lengths of segments 1, 2·4, 3·5, 4, 8. *Epipharynx:* Length 0·133 mm. *Buccal cavity:* 24–26 pointed teeth arranged on arc concave posteriorly, the median teeth being somewhat shorter than the lateral ones; pigmented area large and disc-shaped, somewhat rugged in appearance posteriorly and smoother and convex anteriorly. *Pharynx:* More than six times as wide posteriorly as anteriorly, with a deep indentation at the posterior border. The arrangement of the teeth is in regular rows, being more compact and coarse at the posterior border and at the deep notch, fine and thin towards the inner portion. *Wing:* Length 1·5–1·6 mm., breadth 0·329 mm., alar index 0·72, delta + 0·047–0·05 mm. Spermatheca of *minutus* type.

Male: *Antenna:* Segment III (0·123 mm. or 123μ), shorter than epipharynx (AIII/E = 0·86); formula 1/III–XV. *Epipharynx:* length 0·144 mm. *Buccal cavity:* With about 22 pointed teeth on an arc concave posteriorly; chitinisation of the cavity not as heavy as in the female; pigmented area smaller. *Pharynx:* About 2·5 times as broad posteriorly as anteriorly and armed in its posterior portion with irregular rows of teeth. *Terminalia:* Coxite (0·25–0·26 mm.). A little over twice as long as style (0·117 mm.) which bears four terminal spines and a long ventral seta at 0·7; paramere (0·18 mm.) with somewhat blunt tip; penis finger-shaped with blunt extremity; lateral lobe 0·19–0·2 mm. Holotype ♀, Paratypes 2 ♂, 2 ♀, Hyderabad-Deccan (City). In the Malaria Institute of Pakistan, Karachi; other paratypes, (♂ and ♀), in the Malaria Dept. of Hyderabad State.

Type form taken from the N.W.F.P., Pakistan.—Female not available. Male:—*Antenna:* Segment III (0·90 to 0·93 mm. or 93μ) < IV + V (0·123 mm.), shorter than epipharynx (AIII/E = 0·74–0·77); formula 1/III–XV. *Palp:* Formula 1, 2·3, 3·5, 3·8, 7·1. *Epipharynx:* Length 0·118 mm.–0·123 mm. *Buccal cavity:* With about 22 pointed teeth

on an arc concave posteriorly; pigmented area small. *Pharynx:* About 2·5 times as broad posteriorly as anteriorly and armed in its posterior portion with irregular rows of teeth. *Terminalia:* Coxite (0·20–0·22 mm.), 2·4 times as long as the style (0·090–0·095 mm.), which bears four terminal spines and a long ventral seta at 0·6; paramere (0·164–0·168 mm.), with almost blunt tip; penis finger-shaped with blunt extremity; lateral lobe 0·186–0·199 mm.

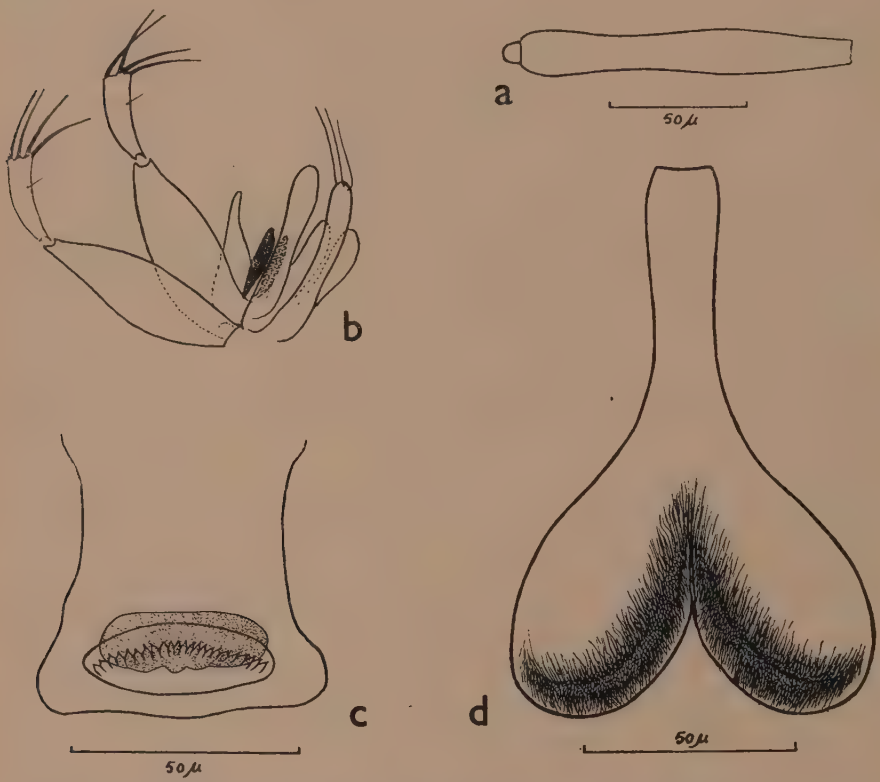

FIG. 1.—*Sergentomyia punjabensis*, deccan form. (*a*) Third antennal segment. (*b*) Terminalia of ♂. (*c*) Buccal cavity of ♀. (*d*) Pharynx of ♀.

DISCUSSION.

Accepting Theodor's (1948) suggestion, in a previous communication the author (1951) adopted the name *Sergentomyia punjabensis* Sinton for this species. But since it has not so far been agreed generally to raise the subgenus *Sergentomyia* to the rank of a genus, and there is not sufficient evidence to justify the separation of the Indian form from Newstead's African species, especially as Kirk and Lewis (1951) have treated *P. signatipennis*, *P. cinctus* and several other closely related forms as varieties of *P. antennatus* Newstead, it has been decided to retain here the same name for the Indian forms also.

A comparison of the *deccan* form with that occurring in N.W.F.P. and other parts of the sub-continent reveals the former as showing constant variations from the type; for example in the female of the Deccan form the length of

AIII is 99–100μ, whereas in the type it is 90μ (Sinton, 1932). From Sinton's figure of the pharynx of the type female it appears that it is 4 times as wide posteriorly as anteriorly, whereas this ratio in the *deccan* form is over 6. AIII in the male (123μ) is also longer than in the N.W.F.P. form (90μ) (Sinton, 1933). Further, the relative measurements of the parts of the terminalia also vary, e.g., the coxite is just twice as long as the style in the *deccan* form, and 2·5 times as long in the type. A comparison of the *deccan* form with all the African varieties of *P. antennatus* shows that, while the female clearly differs from the type as well as from almost all the varieties by the very wide pharynx, it closely resembles *dubius* in most of the measurements and indices. Nevertheless, it is distinguished from *dubius* in the measurement of the pharynx, which in the latter is 4 times as wide posteriorly as anteriorly. While it resembles *dubius* in the shape of the pigmented area, which has a somewhat ragged posterior margin, the smooth and convex anterior margin of the same separates it from that variety, in which it is more or less helmet-shaped. The buccal teeth in the *deccan* form, unlike *dubius*, are almost of the same size. The males also resemble each other very closely except in the number of buccal teeth (being 14–16 in *dubius* and 22 in the *deccan* form), and in the ratio of the coxite to style, which is 2·5 times in the African variety and a little over 2 times in the latter. Thus the *deccan* form not only differs from the other Indian form, but is also distinct from the African species and its varieties.

It would, therefore, appear that there also occurs in the sub-continent a variety of *P. antennatus* distinct from the type form. It is not known whether this form, which may be called **deccanensis** and treated as a new variety, is confined in its distribution to the Deccan plateau and is replaced over the plains by the type, thus affording a case parallel to the mutually exclusive distribution of the very closely allied forms *cinctus* and *signatipennis*, in southern and northern parts of the Sudan respectively. This requires further investigation.

Summary.

Two different forms of *P. antennatus* Newstead, one from Hyderabad State, India, and the other from N.W.F.P., Pakistan, have been described. The *deccan* form, which is treated as a new variety and named *deccanensis*, exhibits close affinities with the African form *antennatus* var. *dubius*.

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Book Notices.

Biology of the Leaf Miners. By E. M. Hering. Royal 8vo. The Hague (Junk), 1951. Pp. 420, 180 figs. Price 36 Guilders.

This volume by the leading authority on leaf mining insects and their mines fills a requirement for a more up-to-date volume than Needham, Frost and Tothill's *Leaf-mining Insects* which was published nearly 25 years ago. The present volume deals not so much with the identification of mines and their producers but with the characteristics of the mines and the particular characteristics of the leaf-mining insects, from which the experienced investigator may readily deduce not only the genus but also the species concerned.

Chapters 2–4 are concerned with the classification of the mines, 5 with change in mining habit, 6 with mining insects, 7–13 with biology, 14–16 with the influence of the mine on the leaf, 17 with changes of instinct in the miners, 18 with the effect of two mines in one leaf, 19 with parasites and inquilines, 20 with the economic importance of mines and miners and 21 with methods of study. A bibliography of some 70 pages completes the work.

This excellently produced volume should do much to stimulate the study of this interesting group of insects which has been somewhat neglected in the past.

Larvae of Insects: An Introduction to Nearctic Species. Part II. Coleoptera, Diptera, Neuroptera, Siphonaptera, Mecoptera, Trichoptera. By Alvah Peterson. Columbus, Ohio (The Author), 1951. Pp. vi + 416, text illust. Price U.S. $7·00.

Keys for the identification of nearctic families are followed by a generalised description of family characteristics, the families being treated in alphabetical order, each family illustrated by figures of one or more genera. A selected bibliography is provided for each order.

VARIATION IN A CHARACTER IN SOME SPECIES OF *PSEUDOCOCCUS* (HEMIPTERA : COCCIDAE).

By R. H. Le Pelley, Ph.D., F.R.E.S.

(*Department of Agriculture, Kenya.*)

Some years ago I had occasion to study the specific identity of an economically important mealybug (Le Pelley, 1935). During the course of this work interest centred on various characters of this and related mealybugs, among which characters were the structures known as multilocular disc pores (Ferris, 1918). While the number of these pores differed greatly between the various species of the closely similar insects studied, it was of interest to determine the range of variation in their numbers within a species. Data were collected on this point which are summarized here as a contribution to our knowledge of the range of variation in one of the characters of the mealybugs.

In order to secure as much genetic uniformity as was possible in the conditions, a living female mealybug, accepted by local specialists as being of the species stated, was selected and isolated on a source of food. There was no control over mating before the female was isolated. From this single mother a family was reared and brought to the adult state when they were preserved, and up to 50 specimens very carefully mounted and the multilocular disc pores counted under the microscope. In each case a permanent record in the form of a drawing was made, either direct with a *camera lucida* or by the use of a magnifying projection apparatus. Although the pores are not very large and are apt to get obscured by folds in the skin of the mount where this is not perfectly made, errors in the totals were found by repeated checking not to exceed 1 per cent. and to be usually very much less. (1) The first insect was *Pseudococcus citri* (Risso), and the work with it was done in Riverside, California. The multilocular disc pores are present ventrally in six or seven segmental rows in the abdominal region. Fifty insects, offspring of one female, were examined, the pores being counted on the anal segment and on segments which, for convenience, will be numbered for this purpose from the anal segment forward towards the head, segments 2, 3, 4, 5, 6, etc.

The results are summarized here :—

	Multilocular disc pores (MDP) vary in number on different segments between—
Anal segment	30– 74
2nd ,,	39–107
3rd ,,	39–117
4th ,,	65–120
5th ,,	45–102
6th ,,	3– 19
7th ,,	0– 5

MDP vary on different insects between—	Mean number of MDP with standard error.
272–489	$380 \pm 6 \cdot 8$

(2) *Pseudococcus gahani* Green from Riverside, California.
47 insects, offspring of one female.

MDP vary between—	Mean number of MDP.
167–324	228±5·1

(3) *Pseudococcus solani* (Cockerell), from Riverside, California.
36 insects, offspring of one female.

MDP vary between—	Mean number of MDP.
10–30	22±1·1

(4) *Pseudococcus kenyae* Le Pelley, from Nairobi, Kenya.
50 insects (not offspring of one female).

MDP vary between—	Mean number of MDP.
66–135	100±2·0

(5) *Pseudococcus kenyae* from various localities in Kenya.
24 insects field collected at different times and places.

MDP vary between—	Mean number of MDP.
75–123	91±2·3

A few other miscellaneous counts are available, the first group being of five mounted specimens of *P. citri* from different places, the identifications having been checked by specialists.

	P. citri.	Total MDP.
1.	From South Africa	455
2.	,, Italy	222
3.	,, Trinidad	246
4.	,, Florida, U.S.A.	237
5.	,, Maryland, U.S.A.	240

It will be noticed that only the first of these comes within the range of the 50 insects from California. No explanation of this is forthcoming, but no doubt in true *citri* the minimum total of multilocular disc pores is in the region of 220, possibly less. Counts on the six available specimens of an unidentified (and probably undescribed) species of *Pseudococcus* from Subukia, Kenya, are given below.

	Total M.D.P.	Mean number M.D.P.
Pseudococcus sp.	113	
	117	
	120	126
	124	
	133	
	151	

This insect is similar to *P. kenyae* but, although the count falls outside the range given for *kenyae* in only one case, the mean number affords an indication that the insect may not be that species.

We may consider shortly the possible bearing of these data on systematic work. It is immediately clear that in view of the range of variation that occurs, the number of multilocular disc pores can only be used as a preliminary indication of specific identity. These records merely strengthen the findings of other workers that the range of variation of many different characters in the Coccidae is such that a single character is not, as a rule, sufficient for specific identification. Brain (1915) came to this conclusion many years ago in a study of the variations in lengths of the antennal joints in the Coccidae. When he had charted these he concluded that the information obtained " supplies a most useful aid for the preliminary location of an insect from slide specimens" but did not generally do more than this. This statement could apply unchanged to the number of multilocular disc pores also. The great range of variation observed by different workers in various characters of these insects emphasizes the difficulty of specific identification.

Specific identification in *Pseudococcus* will usually need to be based on a consideration of a large number of different characters and may require long series of specimens. Unless it is certain that an identification has received this careful consideration with adequate numbers of specimens it would be unwise to base any important decisions on the identification.

Summary.

The range of variation in the number of multilocular disc pores in some species of *Pseudococcus* is recorded as a small contribution to our knowledge of variation in these insects.

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A NEW SPECIES OF *LAEMOPHLOEUS* (COL.: CUCUJIDAE) ASSOCIATED WITH STORED PRODUCTS.

By W. O. Steel and R. W. Howe.

The species dealt with here has been in culture for some years at both Hawthorndale Laboratories, Bracknell, and the Pest Infestation Laboratory, Slough, as an undetermined species. A close examination of all the available *Laemophloeus* material in the British Museum (Nat. Hist.) collection and a study of the literature has failed to identify it and it is therefore described as new.

Laemophloeus pusilloides sp. n.

Body reddish-brown, antennae, legs and, sometimes, elytra, a little lighter, palpi yellowish. Length: ♂, 1·9–2·2 mm., ♀, 1·8–2·1 mm.

♂. Head transverse, the eyes small and slightly prominent; width, including the eyes, about as wide as the pronotum. Finely and rather closely punctured and pubescent. Clypeus very shallowly emarginate in front, labrum truncate in front, the anterior angles broadly rounded. Antennae rather long, the first segment stout, about twice as long as broad, asymmetrical, the external edge straight, the internal dilated, broadly rounded; the second distinctly shorter than the first, widened apically; the third a little shorter than the second, widened apically; the fourth nearly twice as long as broad; the fifth to seventh and ninth and tenth about equal in length, almost three times as long as broad; the eighth slightly shorter than the seventh and ninth; the eleventh distinctly longer than the tenth. Pronotum transverse, 1·23 to 1·36 times as broad as long, narrowed posteriorly, the sides lightly rounded for most of their length, slightly sinuate in front of the posterior angles. Anterior angles obtuse, lightly rounded, the posterior not rounded, rectangular; base sharply emarginate on each side, otherwise straight. On each side, not far from the margin, with a fine raised line. Punctuation and pubescence similar to that on head. Scutellum strongly transverse. Elytra very slightly wider than the pronotum, approximately twice as long as their joint width, rounded apically; each with four linear striae, the intervals between the first and second and second and third striae[1] with three longitudinal rows of fine setiferous punctures; elsewhere with similar punctures not arranged in such regular rows. Chitinized portions of genitalia as in fig. 2.

♀. Head a little less transverse, slightly narrower than the pronotum. Antennae shorter, the fourth segment scarcely longer than the third, the fifth a little longer than the fourth, about one and one-half times as long as broad, the sixth slightly shorter than the fifth, the seventh about as long as the fifth, the eighth about as long as the sixth, the ninth to eleventh longer and broader than the eighth, forming an indistinct three-segmented club. Pronotum less strongly transverse (1·21–1·30 times as broad as long) and somewhat less narrowed posteriorly. Punctuation and pubescence as in male. Spermatheca[2] as fig. 1.

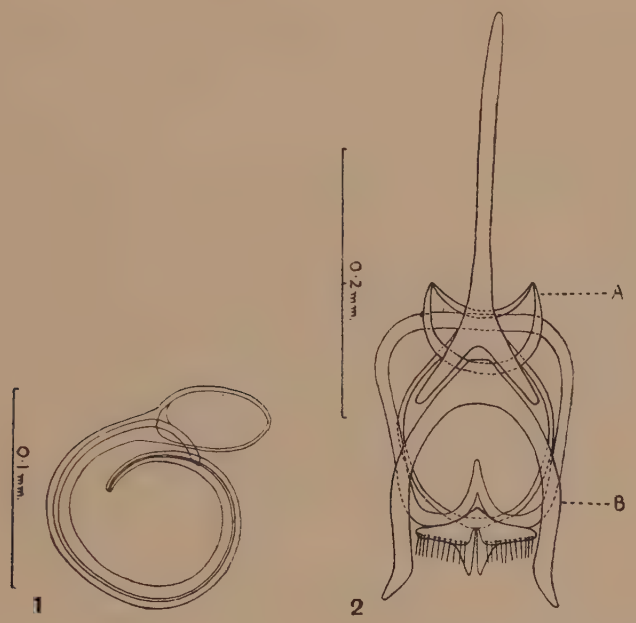
[1] These lines of punctures are best seen on the disc. Towards the front other punctures are interspersed with them, thus obscuring the rows. The interval between the third and fourth striae has three rows of punctures in front, but the outer two merge after a short distance.

[2] The organ called here the spermatheca is homologous with that noted by Reid (1942*b*) who dealt with *L. minutus* (Ol.), *turcicus* Grouv. and *ferrugineus* (Steph.). Whether or not it is the true spermatheca remains to be proved—there is another organ (constant in form for all species examined) which could equally well be this.

Holotype (♀), allotype (♂) and 68 paratypes (2 on slides) taken from cultures bred at the Pest Infestation Laboratory, Slough.

The holotype, allotype and some paratypes will be deposited in the British Museum (Nat. Hist.). Other paratypes will be deposited in various museums and some will be retained by the authors.

Records: Many from S. Africa sent to Pest Infestation Laboratory by M. J. Oosthuizen, Potchefstroom, arriving Nov., 1944; many in Canadian wheat stored at Birkenhead, Jan., 1945 (*C. E. Lucas*); several in English



FIGS. 1–2.—*Laemophloeus pusilloides* sp. n. (1) Spermatheca—viewed from dorsal side. (2) Sclerotized portions of male genitalia—viewed from ventral side.

wheat from a grain store in Bracknell, Berks, May, 1946 (*W. O. Steel*); many in Brazilian rice, London, 15.xii.50–29.iii.51 (*T. Wise, J. Rawnsley, J. Byrd* and *J. Thompson*); many in Brazilian rice, Hull, Feb., 1951 (*E. W. Powell*); many in Australian sorghum, in company with *L. minutus* (Ol.), London, 5.ii.51 (*A. D. Hancock*), 8.ii.51 (*N. Hunter*); 2 exx. in Australian wheat, in company with *L. ferrugineus* (Steph.), London, 8.i.51 (*J. Byrd* and *M. Howroyd*); many in kibbled locust beans from Portugal, London, 2.ii.51 (*T. Wise* and *J. Rawnsley*); 1 ex. in Brazilian rice, Liverpool, May, 1951 (*J. U. Lund*); 1 ex. in Brazilian rice, London, May, 1951 (*C. Wayman*); 1 ex. in Australian flour, London, May, 1951 (*J. Thompson*).

This species is closely allied to both *L. minutus* (Ol.) and *L. turcicus* Grouv. The differences between the three species are shown in the following table:

minutus.	*turcicus*.	*pusilloides*.
Clypeus truncate or very slightly emarginate in front.	Clypeus lightly rounded in front.	Clypeus shallowly but distinctly emarginate in front.
Eyes small and rather flat.	Eyes small but somewhat prominent.	As *turcicus*.
Pronotum more transverse, (1·22–1·34 times as broad as long (♂), 1·17–1·25 times (♀)).	Pronotum less transverse, (1·10–1·21 times as broad as long (♂), 1·09–1·16 times (♀)).	Similar to *minutus* (1·23–1·36 times as broad as long (♂), 1·21–1·30 times (♀)).
Punctures of pronotum fine.	Punctures of pronotum a little coarser.	As *turcicus*.
Anterior angles of pronotum sharply rounded, the posterior rectangular.	Anterior angles of pronotum not rounded, the posterior more acute.	As *minutus*.
Elytra at *most* 2·50 times as long as pronotum in ♂, at *most* 2·60 times in ♀.	Similar to *minutus*.	Elytra at *least* 2·65 times as long as pronotum in ♂, at *least* 2·75 times in ♀.
Elytra at most one and three-quarter times as long as broad.	Elytra twice, or almost twice as long as broad.	As *turcicus*.
Intervals between 1st and 2nd and 2nd and 3rd elytral striae with four rows of punctures.	Intervals between 1st and 2nd and 2nd and 3rd elytral striae with only three rows of punctures.	As *turcicus*.

Besides the above, *pusilloides* also differs from *minutus* and *turcicus* in the form of the spermatheca of the female (fig. 1) and the sclerites marked A and B of the male genitalia (fig. 2). It does not appear to exhibit heterogonic growth of the antennae of the male as was noted by Reid (1942*a*) for the other two species. *L. pusilloides* was mentioned by Lucas and Oxley (1946) and Finlayson (1950) as *Laemophloeus* sp.

Acknowledgments.

Our best thanks are due to Mr. J. Balfour-Browne for facilities for examining material in the British Museum (Nat. Hist.), and to the inspectors of the Infestation Control Division of the Ministry of Agriculture and Fisheries for sending the *Laemophloeus* spp. encountered in the course of their work. It may be mentioned here that, during investigations to ascertain whether *pusilloides* had been previously described, it was found, by examination of the female genitalia, that *L. pauper* Sharp is conspecific with *minutus* (Ol.) and should be placed as a synonym of this.

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TWO NEW AUSTRIAN SPECIES OF *LEPTOCERA* OLIV. (DIPT.: SPHAEROCERIDAE).

By O. W. Richards, M.A., D.Sc.

I had the opportunity recently, through the kindness of Dr. F. van Emden, to examine some Sphaerocerid flies collected in Austria by Dr. H. Franz. Two of them appear to belong to new species and are described below. Dr. Franz has been kind enough to allow me to deposit the types in the British Museum. The wing veins are referred to by the abbreviations used by Duda (1938). Dr. van Emden was good enough to arrange for the wings to be photographed. In each species the right wing of the type is mounted on a slide.

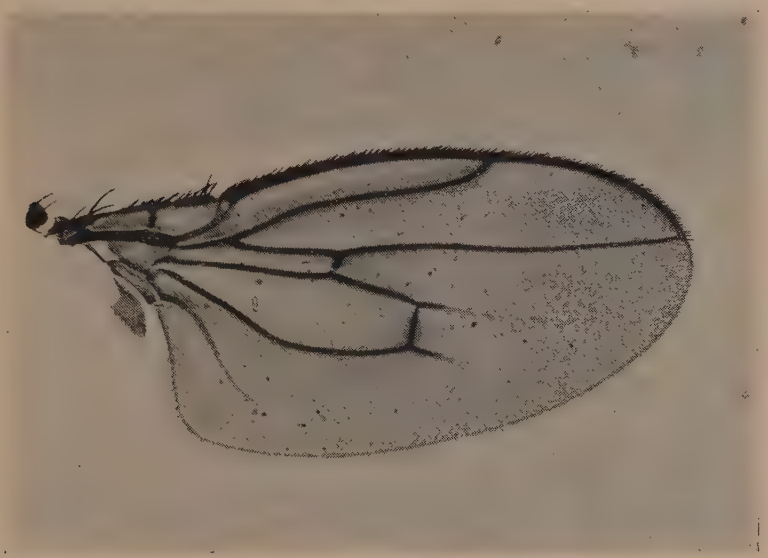

Fig. 1.—Right wing of *Leptocera trichopyga* sp. n.

Leptocera (Limosina) trichopyga sp. n.

Male.—Runs down in Duda's key (1938, *in* Lindner, *Die Fliegen*, **121** : 104) to couplet 29 but differs from *L. fucata* (Rond.), to which it is closely allied, in having *R*5 much less sinuate, especially distally; mid tibia ventrally with no apical bristle but with a small comb of short, stout spines. Basitarsus 2 with one ventral bristle distinctly enlarged. Rather dull black, including mesonotum; front of buccae, facialia, transverse anterior area on frons with long backward projection on each side of frontalia, orange. Legs with trochanters, extreme base of tibiae, and tarsi, yellow brown. Wings a little darkened. Halteres yellow. Rather large species, length about 2·5 mm.

One vibrissa, one large buccal bristle hardly half as long. Two moderate and one minute anterior inter-frontal bristles. Antennae diverging; third segment with short pubescence, arista about three times as long as antenna, with moderately short pubescence. One humeral bristle, one stout dorsocentral just in front of scutellum, which is semi-circular

with four long bristles. One strong sternopleural. Fore femur somewhat enlarged and shining. Mid tibia at proximal third with two moderate anterodorsals and a longer posterodorsal between them, but rather more on the level of the upper one, at four-fifths with a pair of long bristles (anterodorsal and dorsal), rather longer than their distance from the end of the tibia and surmounted by a short anterodorsal, ventrally with no mid-ventral or apical bristles but with a row of short, comb-like spines from rather above middle to apex. Mid femur with a corresponding row of short bristles for almost its whole length but these are finer and somewhat sparser. Mid basitarsus long, just after base with a distinctly enlarged ventral bristle, somewhat longer than cross-section of segment. Wings (fig. 1) with *R*3 parallel to the costa for a considerable distance, then sharply bent on to it ; *mg* 2 distinctly longer than *mg* 3 ; cell broad ; *tp* just over half as long as *ta* – *tp*, both corners of cell emitting short veins ; alula small and narrow. Genitalia with a long bristle on each side of anal split ventrally, below this with a regular comb of converging fine bristles on each side, their tips crossing ; actual genitalia invisible. Sternites broad and flat, up to the fifth, unmodified.

Fig. 2.—Right wing of *Leptocera alloneura* sp. n.

Type ♂, Austria : Niedere Tauern, Bösenstein group (*Franz*) ; paratype ♂, Austria : " 469 *X* " (Franz). The type is in the collection of the British Museum ; the paratype has been returned to Dr. H. Franz.

L. trichopyga can also be made to run down near to *L. longisetosa* (Dahl) but it is larger, the face is not so conspicuously pale yellow, nor are the legs ; *mg* 2 is much longer than *mg* 3, not about equal ; the mid tibia does not have paired long bristles at one-quarter, has no long apical bristle, and the basitarsus has a small outstanding bristle beneath ; the bristles on each side of the anal slit are much longer.

Leptocera (Limosina) alloneura sp. n.

Allied to *L. albinervis* (Duda) but *tp* longer than *ta* – *tp* as in *L. heteroneura* (Hal.) ; costa not or hardly produced beyond *R*5 ; *R*2 nearly straight and only a little bent on to the costa

in distal third. In Duda's key (1938 : 101) runs with difficulty to couplet 17 (*L. meijerei* (Duda), which has reduced wings and a yellow face), or to couplet 7 (*L. collini* Rich., *L. czernyi* Duda, *L. lambi* Duda), but it differs from these in having *mg* 3 much longer than *mg* 2, *tp* distinctly longer than *ta* – *tp*, and the cell broader. It seems really to be closest to *L. albinervis* (Duda), although not running to it in the key.

Male and female.—Black, dull; interfrontalia and mesonotum very little shining; halteres black with stalk a little paler; wings hyaline; length barely 1·0 mm.

Vibrissae rather short, no strong buccal bristle; eyes rather small, buccae at narrowest three-quarters as wide as third antennal segment; 3–4 very small interfrontal bristles; antennae with somewhat longer pale pubescence than usual; arista three and a half times as long as antenna, with moderately long pubescence. One short humeral, one short dorso-central in front of scutellum, which is semicircular with four rather short bristles; two very short sternopleurals. Mid tibia with a small anterodorsal bristle at one-quarter, a longer dorsal bristle at three-quarters surmounted by a very small anterodorsal, no mid-ventral, a long apical ventral bristle; basitarsus rather long. Wings (fig. 2) with *mg* 2 hardly more than half as long as *mg* 3, costa hardly perceptibly produced beyond *R*5, *R*3 quite straight, *R*5 a very little bent forward in its distal half, the amount of curvature showing some variation; wing-tip nearer to end of *R*5 than to point where *M*2 would meet the margin; cell broad; *M*2 and *M*4 extending beyond cell as transparent veins to two-thirds of the way to the margin; *tp* 1·2–1·5 times as long as *ta* – *tp*, alula small and narrow. Male genitalia relatively large and swollen, with no long bristles, appendages not visible. Female cerci long, finger-shaped, bearing one long and two or three shorter woolly hairs.

Type ♂, allotype ♀, 2 ♂ 1 ♀ paratypes, AUSTRIA: Hall bei Admont, on bait in mouse-holes (*Franz*).

The type and allotype and 1 ♂ paratype are in the collection of the British Museum; the other paratypes have been returned to Dr. H. Franz. *L. heteroneura* (Hal.), which has a similar discal cell, has the costa extending far beyond *R*5 and *mg* 2 a little longer than *mg* 3.

BOOK NOTICE.

The Integument of Arthropods: The Chemical Components and their Properties, the Anatomy and Development, and the Permeability. By A. GLENN RICHARDS. 8vo. Minneapolis (Minnesota University Press) and London (Geoffrey Cumberlege), 1951. Pp. xvi + 411, text illust. Price 48*s.* net.

This work is intended primarily for entomologists, but will also form a valuable work of reference for those working in related fields of zoology, chemistry, biochemistry and ecology.

The volume covers and collates material published to the end of 1949 on the chemical and physical properties, the structure and development, and the permeability of the integument of insects and closely related orders. It is divided into three sections, the first of which deals with the chemical components of the cuticle, their combinations and properties. The second section covers the microanatomy and development of the integument, and the third discusses the problems of permeability of the cuticle. There is also an indexed bibliography of some 1800 references, and a subject index, and the volume is illustrated by over 200 line drawings and photomicrographs.

The author is Professor of Entomology and Zoology at the University of Minnesota.

THE HITHERTO UNDESCRIBED MALE OF *ARMIGERES* (*ARMIGERES*) *THEOBALDI* BARRAUD (DIPTERA : CULICIDAE).

By P. F. Mattingly
(*British Museum, Natural History*)

and

M. Qutubuddin
(*Malaria Institute of Pakistan, Karachi*).

The description which follows is based on a number of males from Hyderabad City, Deccan. One set of terminalia are in the British Museum. The remainder of the material is believed to be in the collections of the Malaria Department at Hyderabad. The terminalia are remarkable in that they are of the kind normally encountered in the subgenus *Leicesteria*, although in other respects *theobaldi* is a typical *Armigeres* s. str. Like *conjungens* Edwards, therefore,

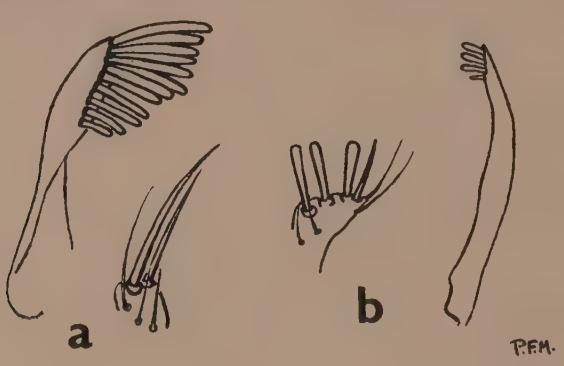

Fig. 1.—*Armigeres* spp. Style and basal lobe of coxite. (*a*) *A.* (*A.*) *theobaldi* Barraud. (*b*) *A.* (*A.*) *conjungens* Edwards.

this species is annectant between the two subgenera. An examination of the female genitalia, however, shows that both species have been correctly placed in the typical subgenus. The description of the male of *A. theobaldi* follows :

Head : Eyes bordered by flat white or creamy scales. Other markings variable. The vertex may bear two stripes of flat white scales separated by a median patch of flat black scales, or these stripes may be reduced to a pair of round spots or absent altogether. In most cases the lateral areas exhibit a patch of broad, flat white scales separated by black scales from the white stripes already mentioned. The nape bears some whitish upright scales. Tori dark brown or black, partly covered with small, broad pale scales. Flagellum and antennal hairs brown. Clypeus brown with a few flat pale scales. Palpi and proboscis dark brown, the palpi exceeding the proboscis by a little less than the length of their terminal segment. *Thorax :* Mesonotum covered with narrow dark brown scales and with a border of yellowish scales all round the margin. Anterior pronotal lobes, pro-epimera, sternopleurae, upper and lower mesepimera, mera and coxae all covered with broad white

scales. Post-spiracular area with a patch of flat white scales and 2–3 bristles. Wings dark scaled. Legs brownish black. Hind femur white on both inner and outer side from base to knee-joint. Mid femur without a definite knee-spot. Fore femur with distinct dorsal knee-spot. Tibiae and tarsi devoid of pale rings. *Abdomen :* Tergal markings very variable. Some specimens have median apical yellow markings as in the female. In others the abdomen is almost entirely dark in dorsal view but a uniform blue sheen and indistinct yellowish apical markings can be seen from certain angles. Venter white scaled and tergites with white lateral markings. *Terminalia* (fig. 1*a*) : Style broadened apically with a row of 12 digitate appendages, the shaft devoid of scales and setae. Coxite without a scale patch on the dorsal border. Basal lobe with two stout unequal spines.

The terminalia of *A. conjungens* have not previously been figured and are therefore shown for comparison (fig. 1*b*).

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Coher, E. I., 1949, A study of the female genitalia of Culicidae with particular reference to characters of generic value. *Ent. amer.* (n.s.) **28** : 75–112.

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Book Notice.

The Sucking Lice. By G. F. Ferris. 8vo. San Francisco (The Pacific Coast Entomological Society), 1951. Pp. ix + 320, text illust. Price $6.00.

The author in his preface states that this work is an attempt to summarize existing knowledge on the systematics of the sucking lice. There are eight chapters covering (1) The ectoparasites of birds and mammals, (2) The morphology and anatomy of the Anoplura, (3) Growth and development, (4) The taxonomic status of the sucking lice, (5) The classification within the order Anoplura, (6) Review of the families, subfamilies, genera and species, (7) Host list, and (8) Distribution.

Complete systematic treatment is given, including keys, synonymy and descriptions.

A hundred and twenty-five of the three hundred and twenty pages consist of figures in the author's own well-known style.

The detailed section on morphology was prepared in collaboration with C. J. Stojanovich, of the Communicable Disease Center, U.S. Public Health Service.

The work is published as the first volume of the new *Memoirs of the Pacific Coast Entomological Society*, and publication was financed in part from the Henry Clinton Fall Memorial Fund.

A STUDY OF THE GENUS *TROPIDAUCHEN* SAUSSURE (ORTHOPTERA : ACRIDIDAE).

By V. M. Dirsh, D.Sc., F.R.E.S.

The genus *Tropidauchen* with two species, *securicolle* and *cultricolle*, was described by Saussure in 1887 (*Spicil. Ent. Genav.* **2** : 72). Kirby fixed *Tropidauchen securicolle* Saussure as the type in 1910 (*Syn. Cat. Orth.* **3** : 348).

Saussure (*l.c.* : 73) pointed out that this genus is similar in its general appearance to the South African Pamphaginae, and regarded it as " an African, strayed to the Orient and, so to speak, still incompletely adapted to the characteristic forms of that region."

I. Bolivar (1916, *Genera Insectorum* **5** : 12) referred the genus *Tropidauchen* to the section *Porthetis*, a group of African genera to which belong : *Lamarckiana* Kirby, *Saussurea* Uvarov, *Porthetis* Serville, *Hoplolopha* Saussure, *Cultrinotus* I. Bolivar, *Stolliana* I. Bolivar, *Bolivarella* Saussure and *Pagopedilum* Karsch. He referred *Tropidauchen* to this group only on the basis of general resemblance, especially the shape of pronotum and the presence of spines on the upper margin of the hind femur. *Tropidauchen* however differs from all genera of the group *Porthetis* by complete absence of wings in both sexes, while in genera of that group wings are partly or, more usually, fully developed in the male, and by filiform antennae, which in the *Porthetis* group are ensiform ; all genera of the group *Porthetis* possess a well developed Krauss organ, while in *Tropidauchen* this organ is indistinct and has a tendency to disappear. Some recently described species of *Tropidauchen* (e.g., *T. miramae* Mistshenko) have the pronotum quite different in shape from the *Porthetis* group, approaching in this respect to the genera *Paranocarodes* I. Bolivar, and *Eunothrotes* Adelung ; in common with these two genera the wings are completely absent and Krauss's organ is indistinct. Therefore *Tropidauchen* belongs to the same group as the two last mentioned genera, differing from them mainly by the spinose upper margin of hind femur. This is also justified geographically, because all genera of this group occur in Western Asia, and partly in the Mediterranean region, while the group *Porthetis* is typically African.

Mistshenko (1951, *C.R. Acad. Sci. U.S.S.R.* **77** : 736) suggested that *Tropidauchen* is a rather isolated genus with remote connections both with the South African Pamphaginae and with the Mediterranean *Paranocarodes*, but the first part of the suggestion is not acceptable for above-mentioned reasons.

Uvarov (1943, *Trans. R. ent. Soc. Lond.* **93** : 21) included *Tropidauchen* in the tribe *Pamphagini* in which he united two of Bolivar's sections, namely *Nocarodes* and *Pamphagi*. But this tribe still includes two different groups of genera. In the first group all genera are quite wingless in both sexes and it includes *Paranocarodes*, *Nocarodes*, *Nocaracris*, *Eunothrotes* and *Tropidauchen*. The second group includes genera with lobiform wings in both sexes or sometimes in males only.

Up to 1951 eleven species of *Tropidauchen* were known, but recently Mistshenko (1951, *l.c.*) described 12 new species and 5 subspecies and divided the

genus into two and referred to the genus *Tropidauchen* the following species known up to 1951 : *T. securicolle* Sauss. (genotype), *T. marginatum* I. Bol. and *T. edentulum* Uv., while he erected a new genus *Saxetania* (based on a new species *S. decumana*), including also *T. sabulosum* Uv., *T. elbursianum* Rme., *T. escalerai* I. Bol., *T. paramonovi* Dirsh, *T. cultricolle* Sauss., *T. uvarovi* Mist., *T. miramae* Mist., and *T. alexandrovi* B.-B.

A complete translation of Mistshenko's description of *Saxetania* gen. n. reads : " Differs sharply from *Tropidauchen* Saussure by the following characters : Frontal ridge, in profile, with a distinct excision immediately below the ocellus, its upper part distinctly projecting forwards. Vertex, in profile, moderately sloping. Hind femora strongly narrowed to the apex. Upper lobe of the femur does not reach its apex and is strongly narrowed towards it ; the lower lobe narrowed to the apex of the femur, its width at the apex $\frac{1}{3}$–$\frac{1}{4}$ the maximal width of the lower lobe of the knee." No diagnosis of the restricted *Tropidauchen* was given by Mistshenko.

As can be seen from the figs. 25, 28, 32, 33, 34, 35, which represent the species included by Mistshenko in *Saxetania*, the excision of the frontal ridge varies widely and all possible intermediate forms between *Saxetania* and *Tropidauchen* (figs. 23, 24, 27) are found. When long series (30–35 specimens) of *T. marginatum*, *T. edentulum* and *T. aelleni* were studied, this character was found to vary widely even within one species.

As may be seen from the same figures, the slope of the vertex also cannot be used to divide the species into two genera.

Figs. 9, 11, 16 represent hind femora of the genus *Tropidauchen* (*sensu* Mistshenko), while the figs. 10, 13, 15, 18, 20, 21 represent *Saxetania* Mist. It is obviously impossible to separate the two groups on the basis of the relative expansion of the upper and lower " lobes " (presumably, the expanded edges) of the hind femur and all transitions occur.

There are, thus, no characters left for separating the genus *Saxetania* Mistshenko and the name is a pure synonym of *Tropidauchen* Saussure.

The new species were described by Mistshenko (*l.c.*) only in Russian, and so briefly that it was impossible to find out their essential characters and relation with the previously known species. Therefore, only a list with complete translations of the descriptions of all his species are given below (pp. 107–109).

Species of the genus *Tropidauchen* vary strongly in their external characters. Size of the body varies widely. The height of the pronotum and its shape in profile also varies in the same species ; the dorsal teeth of the abdomen vary greatly, being more developed in strongly sculptured specimens. The femoral armature also varies in the grade of development of the teeth. General coloration and, sometimes, coloration of the hind tibia vary in intensity and, as in *T. marginatum*, in the shade of coloration, although the last character is stable in most species.

The best characters for distinguishing the species are the shape of prosternal tubercle, partly the shape of pronotum, coloration of the lower surface of the hind femur, coloration of the hind tibia and its spines, and in some cases, the profile of the head.

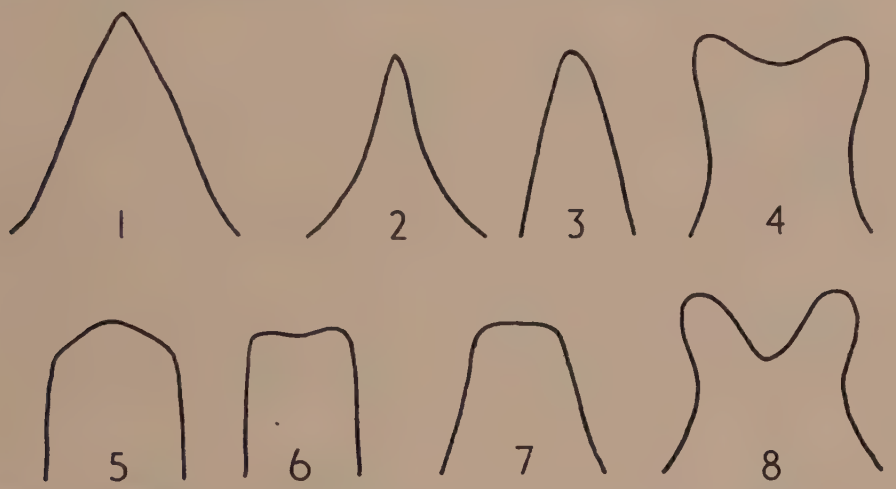
The genus has a comparatively small area of distribution, and is known

T. securicolle, 1. *T. marginatum*, 2. *T. escalerai*, 4. *T. popovi*, 3. *T. edentulum*, 5. *T. dehbidi*, 6. *T. aelleni*, 7. *T. miramae* and *T. uvarovi*, 8. *T. cultricolle*, 9. *T. nizwai*, N. *T. elbursianum*, E. *T. serratum*, S. *T. cristatum*, C. *T. flavipes*, F. *T. predtetshenskii*, C, F. *T. onerosa*, O. *T. muricata*, M. *T. enoda*, K. *T. bactriana*, B. *T. scutata*, G. *T. decumana*, D. *T. spinosa*, P. *T. irrasa*, A.

from Persia and neighbouring parts of Baluchistan, Afghanistan and Russian Central Asia, up to southern Uzbekistan. Ecologically, its distribution is connected with dry mountain habitats up to 9000 ft. Such an ecology and the low mobility of these insects favour the formation of many local races, which vary in their characters, sometimes very strongly. Every mountain, even different parts of the same mountain and smaller localities, has its own population more or less different from the others.

Tropidauchen Saussure.

1887, *Tropidauchen* Saussure, *Spicil. Ent. Genav.* **2** : 72.
1951, *Saxetania* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 738 **(syn. n.)**.

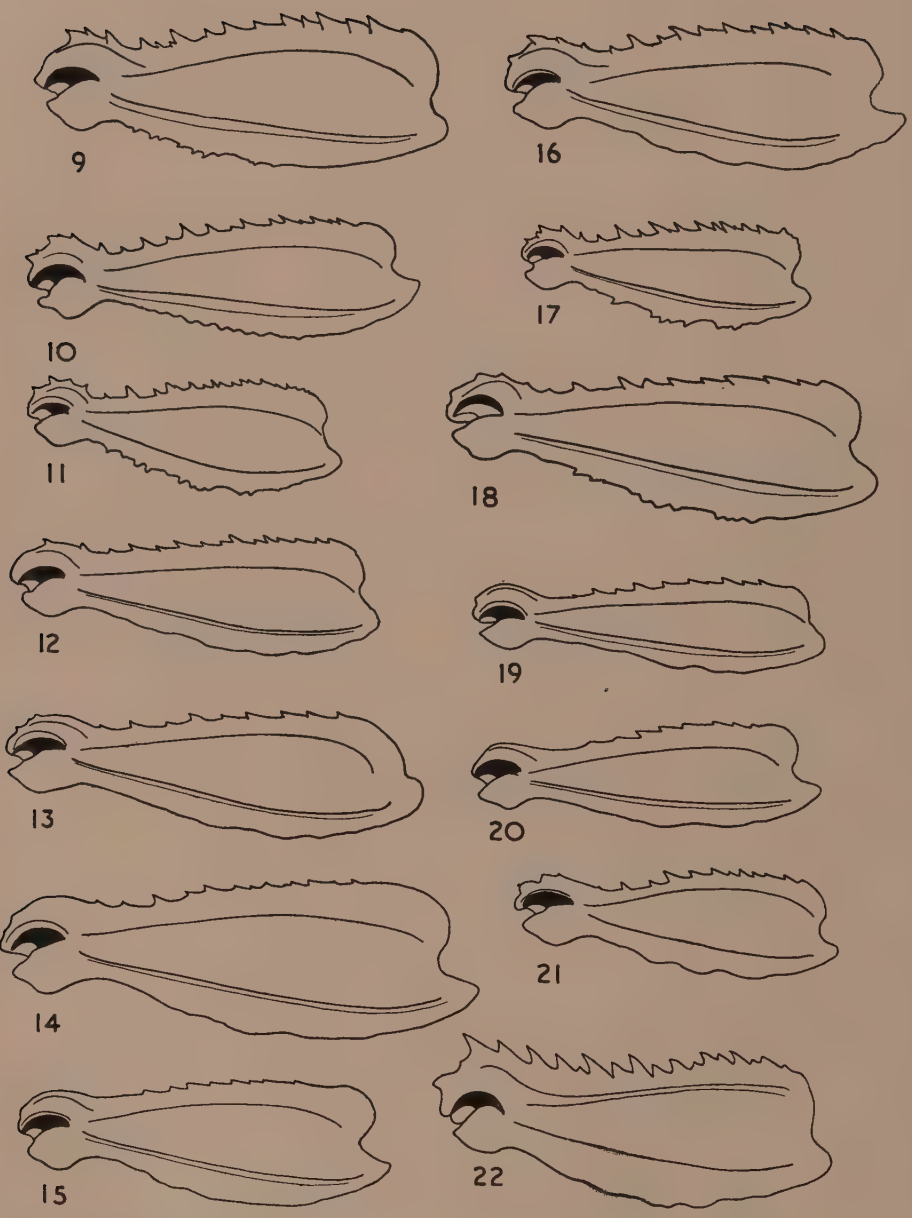


Figs. 1–8.—Main types of prosternal tubercle. 1, *T. marginatum.* 2, *T. aelleni.* 3, *T. popovi.* 4, *T. cultricolle.* 5, *T. elbursianum.* 6, *T. miramae.* 7, *T. uvarovi.* 8, *T. nizwai.*

The following specific key includes 14 species which are known to me from specimens :

Key to Species.

1 (16) Prosternal tubercle seen from in front elongated triangular, with more or less acute apex (figs. 1, 2, 3) ; in profile its anterior margin straight, posterior sloping gradually, apex acute or subacute.
2 (7) Prosternal tubercle relatively broader, distinctly triangular in section, with subacute apex (fig. 1). Pronotum high, strongly compressed laterally, the carina strongly convex (figs. 42–47). Lower surface of hind femur not distinctively coloured.
3 (4) Lower margin of hind femur with short, acute serrulations in the distal half (fig. 9) . . . . . **securicolle** Sauss.
4 (3) Lower margin of hind femur undulated (figs. 10, 16).
5 (6) Lower margin of hind femur with broad undulations (fig. 16) **marginatum** I. Bol.



FIGS. 9–22.—Hind femur. 9, *T. securicolle*, ♂. 10, *T. escalerai*, ♂. 11, *T. edentulum*, ♂. 12, *T. dehbidi*, ♂. 13, *T. cultricolle*, ♂. 14, *T. nizwai*, ♀. 15, *T. elbursianum*, ♀. 16, *T. marginatum*, ♂. 17, *T. popovi*, ♂. 18, *T. sabulosum*, ♀. 19, *T. aelleni*, ♂. 20, *T. miramae*, ♂. 21, *T. uvarovi*, ♂. 22, *T. viridis*, ♂ (*T. viridis* after Bey-Bienko).

6 (5) Lower margin of hind femur with narrow undulations (fig. 10) **escalerai** I. Bol.

7 (2) Prosternal tubercle narrow, conical or indistinctly triangular in section with acute or subacute apex (figs. 2, 3). Pronotum relatively low, less compressed laterally, its carina weakly convex or almost straight. Lower surface of the hind femur dark bluish-black or bluish-grey (except *T. aelleni*).

8 (13) Hind femur broad (ratio of length to width 2·6–2·8), its lower margin with irregular, obtuse serrulations (figs. 11, 17, 18).

9 (10) The whole body with numerous dense, acute teeth and granules. Frons, in profile, strongly excised (fig. 26). External spines of hind tibia internally salmon-pink ; internal spines externally dark blue, internally light salmon-pink . . . **popovi** sp. n.

10 (9) Body moderately sculptured. Frons, in profile, moderately excised (figs. 27, 28). Hind tibial spines of another coloration.

11 (12) Hind femur relatively short (fig. 11). External spines of hind tibia dirty grey-yellowish on both sides ; internal spines, externally blackish-blue, internally dirty yellowish-grey **edentulum** Uv.

12 (11) Hind femur relatively long (fig. 18). External spines of hind tibia externally greyish, internally violaceous ; internal spines, externally blackish, internally light bluish . . . **sabulosum** Uv.

13 (8) Hind femur narrow (ratio of length of width 3–3·5), its lower margin broadly undulated (figs. 12, 19).

14 (15) Hind femur broader (ratio of length to width 3) (fig. 12). Hind tibia internally light yellow, with pinkish hue . . **dehbidi** sp. n.

15 (14) Hind femur narrower (ratio of length to width 3·5) (fig. 19). Hind tibia internally dark blue, turning to pink at the apex **aelleni** sp. n.

16 (1) Prosternal tubercle, seen from in front, spatulate, with broad obtusangulate, truncate, or more or less excised apex (figs. 4–8) ; in profile, its anterior margin almost straight, the posterior one sloping gradually, apex subacute.

17 (18) Lower surface of hind femur bluish-black. Body weakly sculptured . . . . . **miramae** Mist.

18 (17) Lower surface of hind femur light coloured. Body more or less strongly sculptured.

19 (22) Apex of prosternal tubercle, seen from in front, more or less excised (figs. 4, 8).

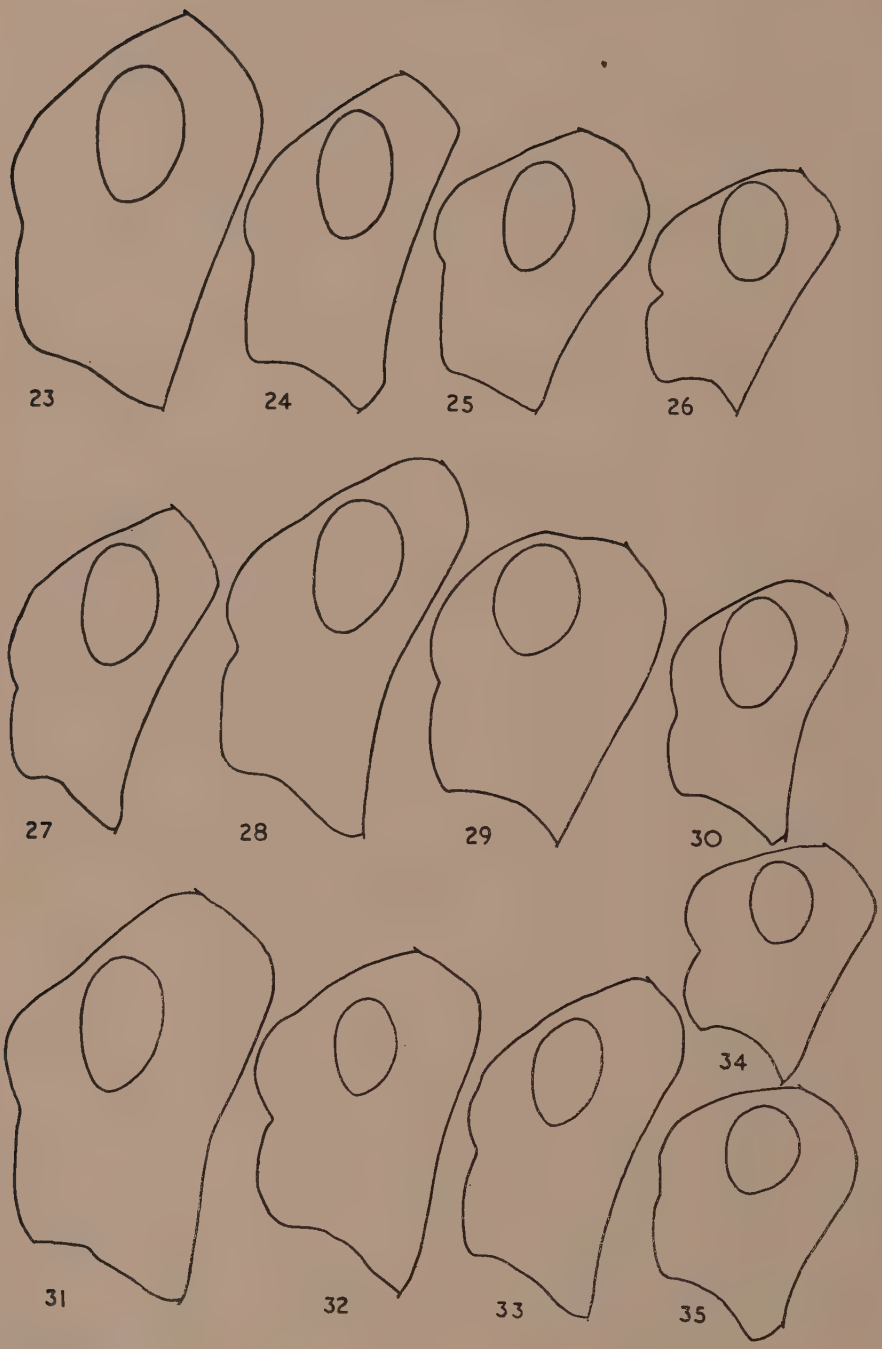
20 (21) Apex of prosternal tubercle moderately excised (fig. 4). Hind tibia internally blue ; internal spines yellow. Frons deeply excised in profile (fig. 32) . . . . . **cultricolle** Sauss.

21 (20) Apex of prosternal tubercle deeply exised (fig. 8). Hind tibia and its spines dirty yellowish-grey. Frons moderately excised in profile (fig. 31) . . . . . **nizwai** sp. n.

22 (19) Apex of prosternal tubercle truncate or obtusangulate (figs. 5, 7).

23 (24) Apex of prosternal tubercle truncate (fig. 7). Hind tibia internally pinkish. Frons deeply excised in profile (fig. 34) **uvarovi** Mist.

24 (23) Apex of prosternal tubercle obtusangulate (fig. 5). Hind tibia internally violaceous, turning to pink at the apex. Frons shallowly excised in profile (fig. 33) . . . . **elbursianum** Rme.



FIGS. 23–35.—Head in profile. 23, *T. securicolle*, ♂. 24, *T. marginatum*, ♂. 25, *T. escalerai*, ♂. 26, *T. popovi*. ♂. 27, *T. edentulum*, ♂. 28, *T. sabulosum*, ♀. 29, *T. dehbidi*, ♂. 30, *T. aelleni*, ♂. 31, *T. nizwai*, ♀. 32, *T. cultricolle*, ♀. 33, *T. elbursianum*, ♀. 34, *T. uvarovi*, ♂. 35. *T. miramae*, ♂.

1. *Tropidauchen securicolle* Saussure (figs. 9, 23, 42, 43).

1887, *Tropidauchen securicolle* Saussure, *Spicil. Ent. Genav.* **2** : 73, no. 1, f. 23, 23*a*.

This species was described on the basis of probably a single male and a single female from " Syria (Mus. Genavense et Parisiense)." The type was not fixed. I have examined the single male specimen preserved in the Geneva Museum and have fixed it as the type.

The locality " Syria " for this species is certainly incorrect, and Saussure (*l.c.* : 72) himself expressed a doubt about the locality. The type is probably of Persian origin, and I refer to this species a female from Isfahan in the British Museum collection.

♂ (type). Re-description. Body large, strongly rugulose-granose with acute tubercles.

Frons, in profile, weakly excised and feebly projecting above the excision. Fastigium of vertex irregularly hexagonal, strongly narrowing to the apex, strongly concave, with sharp margins.

Pronotum strongly compressed laterally, in profile, with high, convex carina, its anterior and posterior angles strongly projecting ; the anterior one covers base of fastigium concavity, the posterior one reaches the middle of the first abdominal tergite and is deeply bifurcate. Prosternal tubercle triangular in section, seen from the front narrow triangular ; in profile, its anterior margin almost straight, the posterior one sloping gradually ; apex subacute. Dorsal teeth of abdominal tergites large and acute.

Hind femur broad, ratio of length to width 2·6, with strongly expanded margins ; upper margin armed with large acute spines ; the lower one with small subacute teeth in the apical half.

Subgenital plate short, subconical.

Coloration greyish ; lower surface of hind femur lightish-grey ; hind tibia internally yellowish, to the apex slightly dirty-orange ; all spines not distinctively coloured.

♀. As the male but much larger.

Length of body, ♂ 42 mm, ♀ 58–63 mm ; pronotum, ♂ 19·5 mm, ♀ 24·5–25 mm ; hind femur, ♂ 18 mm, ♀23–24·5 mm.

Persia : Isfahan, Gav. Pice, 10.v.1949, 1 ♀ (*Hamid Zade*).

2. *Tropidauchen marginatum* I. Bolivar (figs. 1, 16, 24, 44, 45).

1912, *Tropidauchen marginatum* I. Bolivar, *Trab. Mus. Cienc. Nat. Madrid* **4** : 13.
1950, *Tropidauchen alexandrovi* Bey-Bienko, *C.R. Acad. Sci. U.S.S.R.* **73** : 1091, f. 3 (**syn. n.**).

I studied two cotypes of this species (male and female), which was described from Chagajor, Haut Karun (S.W. Persia), as well as a large series of specimens, showing the range of variation.

The most characteristic features of *T. marginatum* are :

Big and robust, with strongly granulose body ; frons, in profile, shallowly excised and weakly projecting above the excision ; prosternal tubercle, seen from the front, broadly triangular, with subacute apex ; pronotum very high (height of pronotum varies in specimens from different localities), strongly compressed laterally, its carina strongly convex, with both angles strongly projecting, the posterior one with bifurcate apex ; dorsal teeth of abdominal tergites small and acute (or obtuse, in less sculptured specimens) ; hind femur broad, but varies in width ; ratio of length to width about 2·7, with strongly and deeply serrulated upper and broadly undulated lower margins ; general coloration light yellow, whitish-grey, greyish to brownish-grey ; lower surface of hind femur not distinctively

coloured ; hind tibia internally and partly above yellow, sometimes pinkish or light violaceous, to the apex sometimes pink or reddish, in the females often of the same coloration as the whole body ; spines not distinctively coloured.

Length of body, ♂ 28–38 mm, ♀ 46–61 mm ; pronotum, ♂ 14–22 mm, ♀ 24–28 mm ; hind femur, ♂ 16·5–24·5 mm, ♀ 24–27 mm.

Persia : Dasht-i-Rzan, Nr. Bushire, 22.v.1927, 4 ♂, 6 ♀. Between Shiraz and Bushire, 1.v.1927, 1 ♂, 2 ♀. Between Shiraz and Kazerun, 22.v.1927, 1 ♂ (*M. M. Siazov*). Fars, Kakan, 25.vii.1949, 2 ♂, 12 ♀. Fars, Kumehr, 4.viii.1949, 1 ♀. Fars, Gardaneh Bijan, 31.vii.1949, 1 ♀ (*Mirzoyan*). Isfahan, vi.1950, 2 ♀ (*Sadughi*). Fars, Barm-i-firuz, 10.vii.1950, 1 ♀; Kumehr, 8000 ft., 10.vii.1950, 1 ♂, 1 ♀ (*E. P. Wiltshire*).

T. alexandrovi, recently described by Bey-Bienko from an unknown locality in Iran, does not differ from *T. marginatum* I. Bol. in its description and figure.

3. *Tropidauchen escalerai* I. Bolivar (figs. 10, 25, 46, 47).

1912, *Tropidauchen escalerai* I. Bolivar, *Trab. Mus. Cienc. nat. Madr.* **4** : 11.

I examined two cotypes of this species, male and female, from Gotvend, S.W. Persia. *T. escalerai* is related to *T. marginatum*, but differs from it by the following characters :

Frons, in profile, is more deeply excised than in *T. marginatum* ; dorsal teeth of abdominal tergites acute, comparatively large and finely serrated ; hind femur broad, but narrower than in *T. marginatum*, ratio of length to width 2·9, upper margin with strong acute spines, lower one finely undulated. Coloration yellowish-grey ; hind femur below not distinctively coloured ; hind tibia internally and partly above, pinkish ; the spines pale, slightly darkened at the apex. In other characters similar to *T. marginatum*.

4. **Tropidauchen popovi** sp. n. (figs. 3, 17, 26, 54, 55.)

♂ (type). Body of medium size, with strongly acute tubercles and granules.

Frons, in profile, sharply excised and strongly projecting above the excision. Fastigium of vertex irregularly hexagonal, weakly concave, with sharp margins and strongly and densely granulated surface.

Pronotum, in profile, with comparatively low and little convex carina, its anterior angle strongly produced forwards but does not reach the concavity of fastigium of vertex ; posterior angle little produced backwards, reaching the first abdominal tergite and shallowly excised at the apex. Prosternal tubercle seen from the front narrow conical, in profile with straight anterior and gradually sloping posterior margins. Dorsal teeth of abdominal tergites sharp and acute apically.

Hind femur broad ; ratio of length to width 2·6, with very acute, dense, irregular spines on the upper margin ; lower margin with irregular, broad, obtuse teeth.

Subgenital plate subconical.

Coloration brownish-grey, with small dark indistinct spots ; lower surface of hind femur blackish ; hind tibia internally bluish-black, turning to pink to the apex, above light blue ; internal spines externally dark blackish-blue, internally salmon-pink ; the external spines internally salmon-pink, externally greyish ; all apices brown ; hind tarsus internally pink.

Length of body, ♂ 30 mm, ♀ 47 mm; pronotum, ♂ 12·5 mm, ♀ 17·5 mm ; hind femur, ♂ 15·3 mm, ♀ 21 mm. .

Persia : Tangeh, N. Kerman (about 29° 35′ N., 46° 25′ E.), 9000 ft., 29.v.1950, 3 ♂ (including type), 1 ♀. Khane-Surkh, 4.vi.1951, 6 ♂, 4 ♀ (*G. V. Popov*).

5. *Tropidauchen edentulum* Uvarov (figs. 11, 27, 52, 53).

1923, *Tropidauchen edentulum* Uvarov, *J. Bombay nat. Hist. Soc.* **29** : 648, f. 2.

T. edentulum was described from Abadeh (S.W. Persia) on a single male. The most characteristic features of this species are as follows :

Frons, in profile, little excised ; pronotum, in profile, relatively low, with weakly convex carina ; prosternal tubercle, seen from the front, acute, conical, in profile its anterior margin straight, the posterior one sloping ; hind femur short, moderately broad, ratio of length to width 2·6 ; its upper margin with acute irregular spines, the lower one with irregular obtuse teeth ; lower surface of the hind femur dirty greyish-blue or bluish-black ; hind tibia internally blackish-blue ; the internal spines externally blackish-blue, internally dirty yellowish ; the external ones dirty yellowish-grey on both sides.

The female as the male, but larger and more robust.

Measurements of female : length of body 40mm ; pronotum 17·8 mm ; hind femur 15·3 mm.

Persia : Dehbid, 6.viii.1950, 1 ♀ (*E. P. Wiltshire*). Nr. Aliabad, 8.v.1951, 17 ♂, 22 ♀. Chah Chagok, 5.vi.1951, 2 ♂, 2 ♀ (*G. V. Popov*).

6. *Tropidauchen sabulosum* Uvarov (figs. 18, 28, 49).

1923, *Tropidauchen sabulosum* Uvarov, *J. Bombay nat. Hist. Soc.* **29** : 649, f. 1.

Described from Ker-Man-Balk (North Persia) on a single female in the Oxford Museum.

Differs from other species by the following characters :

Frons, in profile, deeply excised ; pronotum with low, weakly convex, almost straight, carina ; prosternal tubercle, seen from the front, acute conical in profile, its anterior margin straight, slightly curved backwards at the apex, the posterior one sloping ; hind femur moderately broad, ratio of length to width 2·8, shallowly serrated and with small subacute spines on the upper margin, the lower one with obtuse, partly smoothed teeth ; lower surface of the hind femur bluish-grey ; hind tibia internally bluish-black, turning to blackish-violaceous near the apex ; internal spines, externally blackish, internally light bluish ; external spines, internally violaceous, externally greyish.

7. **Tropidauchen dehbidi** sp. n. (figs. 12, 29, 51.)

♂ (type). Of medium size and relatively slender. Body moderately sculptured and granulose.

Frons, in profile, weakly excised and weakly projecting above the excision. Fastigium of vertex shallowly concave, hexagonal, with the angles indistinct, carinulae obtuse.

Pronotum, in profile, low, carina weakly convex, the anterior angle well projecting forwards, posterior one moderately projected, reaching the middle of the first abdominal tergite, and weakly bifurcate at the apex. Prosternal tubercle narrow, in cross section indistinct triangular, seen from the front, narrow triangular, in profile its anterior margin straight, vertical, the posterior one gradually sloping. Dorsal teeth of abdominal tergites small and obtuse apically.

Hind femur moderately broad, ratio of length to width 3·0, with small subacute spines on the upper margin, lower margin broadly undulated.

Subgenital plate, in profile, subconical.

General coloration dirty yellowish-grey ; abdomen with indistinct small dark spots ; lower surface of hind femur dull bluish-black ; hind tibia internally and partly above,

salmon-pink; internal spines externally salmon-pink with blackened apices, internally yellowish, with weak pinkish shadow; external spines yellowish-grey.

Length of body 41 mm; pronotum 15·5 mm; hind femur 17·5 mm.

PERSIA: Deh-Bid, 15.vii.1949, 1 ♂ (type) (*Mirzayan*). Kuh-Bidistan, near Deh-Bid, 5.viii.1950, 1 ♂ (*E. P. Wiltshire*).

8. *Tropidauchen aelleni* Dirsh (figs. 2, 19, 30, 56, 57).

1952, *Tropidauchen aelleni* Dirsh, *Verh. naturf. Ges. Basel* **63**: 13.

♂ (type). Small, with moderately sculptured and granulose body.

Frons, in profile, shallowly excised, little projecting above the excision. Fastigium of vertex elongated, shallow concave, hexagonal, limited by distinct carinulae, in the basal part with indistinct median carinula.

Pronotum, in profile, low, with almost straight, slightly convex carina; the anterior angle slightly projecting forwards, the posterior one reaching to the middle of metanotum and does not bifurcate at the apex. Prosternal tubercle from all sides acute conical. Dorsal teeth of abdominal segments small and acute.

Hind femur narrow, ratio of length to width 3·5, with shallowly, acutely, serrated upper and undulated lower margins.

Subgenital plate, in profile, rounded, with short, acute, apical projection.

Coloration dirty brownish-grey; hind tibia internally dark blue, turning to pink at the apex. External spines, internally lemon-yellow, externally grey; internal spines, externally bluish-black, internally dirty grey, at the apical part of tibia, slightly pinkish; all with dark apex. Hind tarsus internally pink.

♀ (paratype). As the male but larger, with less granulose body.

Length of body, ♂ 23·5–30 mm, ♀ 37·5–42 mm; pronotum, ♂ 9·5–10·5 mm, ♀ 12–14 mm; hind femur, ♂ 13–15 mm, ♀ 17–19 mm.

PERSIA: Kirman: Kuh-i-Djamal Bariz, 8.v.1948, 5 ♂ (including type), 7 ♀. South of Bam, 8.v.1948, 3 ♂, 1 ♀. Ebene N. of Sabzawaran, 9.v.1948, 2 ♂, 6 ♀ (*P. Aellen*). Jamal-Bariz, 6.v.1951, 7 ♂, 3 ♀ (*G. V. Popov*). Type in Basel Museum, some paratypes in the British Museum.

T. aelleni differs strongly from the other species by the narrower hind femur, low almost straight pronotal carina and acute conical prosternal tubercle.

T. onerosa Mist. (p. 108) appears to have a similar pronotum, but the description makes it impossible to decide its relation to *T. aelleni*. The two species are geographically remote from each other.

9. *Tropidauchen miramae* Mistshenko (figs. 6, 20, 35, 36, 37).

1937, *Tropidauchen miramae* Mistshenko, *J. Bombay nat. Hist. Soc.* **39**: 802, f. 1, 2.

The most characteristic features of this species are:

Body less sculptured than in the other species of the genus; prosternal tubercle, seen from the front, spatulate, with shallowly excised apex; in profile, its anterior margin almost straight, the posterior one sloping; pronotal carina low, with little projecting angles, the posterior one scarcely bifurcate; dorsal teeth of abdominal tergites obtuse and indistinct; hind femur narrow, ratio of length to width 3·1, with sparse shallowly serrated upper, and broadly undulated lower margins, lower surface of the hind femur dark blue; hind tibia internally and above yellow; spines yellow, with dark apex.

NORTH AFGHANISTAN: Mazar-i-Sherif, Morbek, 22.vi.1930, 1 ♂, 1 ♀ (paratypes).

10. *Tropidauchen uvarovi* Mistshenko (figs. 7, 21, 34, 38, 39).

1937, *Tropidauchen uvarovi* Mistshenko, *J. Bombay nat. Hist. Soc.* **39** : 801, f. 1, 2.

Differs from the other species by the following characters :

Prosternal tubercle, seen from the front, spatulate, apex truncate, with rounded angles ; in profile, its anterior margin straight, the posterior one sloping ; pronotal carina low, its angles weakly projecting, the posterior one shallowly bifurcate ; dorsal teeth of abdominal tergites distinct, but obtuse ; hind femur broad, ratio of length to width 2·9, its upper margin moderately serrated with acute teeth, the lower one strongly undulated ; hind tibia internally pinkish ; internal spines, externally pinkish.

North Afghanistan : Mazar-i-Sherif, valley Ailjak, 26.vi.1930 1 ♂, 1 ♀ (paratypes).

11. *Tropidauchen cultricolle* Saussure (figs. 4, 13, 32, 40, 41).

1887, *Tropidauchen cultricolle* Saussure, *Spicil. Ent. Genav.* **2** : 74, no. 2.
1927, *Tropidauchen paramonovi* Dirsh, *Bol. Soc. esp. Hist. Nat.* **27** : 8, f. 1 (**syn. n.**).
1951, *Saxetania paramonovi fuscipes* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 5 (**syn. n.**).
1951, *Saxetania cultricollis tumulosa* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 740, f. 11 (**syn. n.**).
1951, *Saxetania cultricollis gibbosa* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 740, f. 12 (**syn. n.**).

This species was described from " Turquestania meridionalis : Aschabad (Coll. Brunner de W.)." A female specimen, with identical label, preserved in the Geneva Museum, was examined. I have fixed this specimen as the type, because two other female specimens in that Museum are not mentioned in the original description ; they bear labels " Coll. Pictet " and " *Tropidauchen cultricolle* " but no locality labels. The type-specimen is from spirit, discoloured, but its structure is well preserved.

T. paramonovi Dirsh, from Firuza, Kopet-Dag mountains, I now consider as identical with *cultricolle* Saussure. *T. p. fuscipes* Mist., which was described on 4 specimens from the same range and particularly from mount Shakh-Shakh, is also a synonym of this species.

T. c. tumulosa Mist. was described also from Kopet-Dag mountains (Village Saratovsky) from 3 specimens.

T. c. gibbosa Mist. was described from a single female from Guven-Dore, also Kopet-Dag. It is hardly possible to suppose that all these subspecies should be given that rank. They are all from the same mountain range as the typical subspecies, differences are small and based on very insufficient material. They may represent local populations, not deserving special names.

♀ (Type). Re-description. Body large and strongly sculptured.

Frons, in profile, deeply excised and strongly projecting above the excision. Fastigium of vertex hexagonal, strongly concave, with sharp margins.

Pronotum moderately compressed laterally, in profile, with a low and slightly convex carina, its anterior angle well produced forwards but not covering the fastigial concavity, the posterior one short and reaching to the metanotum only, its apex shallowly excised. Prosternal tubercle, seen from the front, spatulate, with excised apex ; in profile, acut-angulate, with straight anterior and sloping posterior margins. Dorsal teeth of abdominal tergites small and obtuse.

Hind femur moderately broad, ratio of length to width 3·3, with shallowly serrated upper, and undulated lower margins.

General coloration light yellowish-grey. Lower surface of hind femur not distinctively coloured; hind tibia above, bluish, internally dark blue; internal spines bright yellow.

♂. As the female, but much smaller. Subgenital plate broadly conical.

Length of body ♂ 25–27 mm, ♀ 37–57 mm; pronotum ♂ 9–12 mm, ♀ 14–19 mm; hind femur ♂ 15–17·5 mm, ♀ 19–24 mm.

Varies in the size, and intensity of body sculpture; in the depth of the excision of prosternal tubercle and general coloration of body, from yellowish-grey to dark brown, sometimes with irregular dark brown and dirty white spots.

The specimens from Shahrud are smallest in size.

Turkmenistan: Mountains Kopet-Dagh: Prochladnaya, 5.v.1926, 1 ♀, 24.vi.1927, 2 ♀; Firuza, 13.v.1926, 1 ♀; Nachur, 23.v.1927, 1 ♀; Turbet (Persian side of Kopet-Dagh), 4.vii.1927, 1 ♀ (*L. Moritz*). Tekke, 1 ♂. Hodscha Kala, 2 ♀ (*Radde*).

Afghanistan: Hari-Rud, 1 ♂, 1 ♀. (Specimens determined by Kirby as *Eunapius granosa* St. and referred by Mistshenko (1937 *l.c.*) to an undescribed species.)

Persia: 30 km. East of Shahrud, 1200 m. 14.vi.1938, 1 ♂, 1 ♀ (*P. Aellen*).

12. *Tropidauchen nizwai* Dirsh (figs. 8, 14, 31, 48).

1952, *Tropidauchen nizwai* Dirsh, *Verh. naturf. Ges. Basel.* **63**: 13.

♀ (Type). Body robust and moderately sculptured. Frons, in profile, moderately excised and moderately projecting above the excision. Fastigium of vertex hexagonal, elongated, with sharp margins and a weak median carinula which, in the anterior part, is almost obliterated.

Pronotum, in profile, moderately convex with rounded carina; its anterior angle strongly projecting forwards, but not reaching the concavity of fastigium of vertex; the posterior angle almost reaching the first abdominal tergite and weakly bifurcate at the apex. Prosternal tubercle, seen from the front, spatulate, with deeply bifurcate apex; in profile, with almost straight anterior and sloping posterior margins and subacute apex. Dorsal teeth of abdominal tergites small and obtuse.

Hind femur moderately broad, ratio of length to width 2·9, with shallowly and acutely serrated upper and undulated lower margins.

Coloration dirty yellowish-grey, including hind tibia and spines; the lower surface of the hind femur not distinctively coloured.

Length of body 43 mm; pronotum 15·5 mm; hind femur 22 mm.

N. Persia: Mazanderan, between Djatsham and Guelle, N. of Kuh-i-Nizwa, 2200–2600 m., 28.vii.1948, 2 ♀ (*P. Aellen*). Type in Basel Museum, paratype in British Museum.

This species belongs to the group with broad and deeply bilobate prosternal tubercle; to the same group probably belong also *T. decumana* Mist., *T. spinosa* Mist. and *T. irrasa* Mist. *T. nizwai* is probably nearest to *T. spinosa* Mist. and may even be identical with it, the type localities of the two being near each other. Mistshenko's description (p 109.), however, is insufficient to decide on the synonymy.

13. *Tropidauchen elbursianum* Ramme (figs. 5, 15, 33, 50).

1929, *Tropidauchen elbursianum* Ramme, *Eos* **5** : pl. 5, f. 4.

This species was described from Shah-Kuh, on a single female. I have also a second female from the same locality.

The best characters of this species are :

Frons, in profile, shallowly excised and moderately projecting above the excision ; pronotum with low carina and little projecting angles, the posterior angle reaching to the middle of metanotum ; prosternal tubercle, seen from the front, moderately broad, spatulate, at the apex broadly obtusangulate, almost rounded (in Ramme's figure is more sharply angulate) ; in profile, its anterior margin almost straight, the posterior one irregularly and gradually sloping ; hind femur broad, ratio of length to width 2·8, with shallowly and acutely serrated upper and undulated lower margins ; lower surface of hind femur not distinctively coloured ; hind tibia internally light violaceous, turning pinkish to the apex ; internal spines, externally violaceous, internally light greyish ; external spines on both sides yellowish-grey.

Persia : Shah-Kuh, 1 ♀ (*Christoph*).

14. *Tropidauchen viridis* Bey-Bienko (fig. 22).

1950, *Tropidauchen viridis* Bey-Bienko, *C.R. Acad. Sci. U.S.S.R.* **73** : 1091, f. 2.

This species was recently described from " Iran, Kurdistan " without exact locality. Owing to the prosternal tubercle, which was described as " cuneiform, with the apex, in profile, divided in two teeth," this species may be differentiated from the other ones.

15. *Tropidauchen serratum* Mistshenko.

1951, *Tropidauchen serratum* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 737, f. 1.

" Nearest to *T. viridis* B.-B. Differs by the maximal width of its narrow vertex of male, which is almost one-third its length, and by the broadly rounded anterior margin of mesosternum of male with a distinct thickening near this margin. Length of body 34·6. North Persia : Astrabad, 1 ♂."

16. *Tropidauchen cristatum* Mistshenko.

1951, *Tropidauchen cristatum* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 737, f. 2.

" Near to *T. flavipes* Mist. but differs by the thickening of the anterior margin of mesosternum in both sexes, which reaches to the mesosternal lobes ; by the length of the narrow cercus of ♂, which is twice as long as its maximal width. Length of body ♂ 39·5–47·8, ♀ 71·6–76·9. Persia : Faraghan, Malat-Abad, 5 ♂, 4 ♀."

17. *Tropidauchen flavipes* Mistshenko.

1951, *Tropidauchen flavipes* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 738, f. 3.

" Extremely near to *T. cristatum* Mist., but differs by the thickening of the anterior margin of the mesosternum of ♂, which does not by far reach the mesosternal lobes ; by the length of the broad cercus of ♂, which is 1·5 times its maximal width. Together with *T. cristatum* Mist. and *T. predtetshenskii* Mist., similar to *T. securicolle* Sauss. ; all of them differ from the last by the narrow, almost oval vertex of ♂. Length of body ♂ 38·8–40·4. N. Persia : Semnan, 2 ♂."

18. *Tropidauchen predtetshenskii* Mistshenko.

1951, *Tropidauchen predtetshenskii* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 738.

" Near to *T. cristatum* Mist. and *T. flavipes* Mist., differing from both by the orange internal side of the hind tibia of ♂, by the moderate width of the interspace of mesosternum of ♂, which is considerably less than the minimum width of the mesosternal lobe. Length of body ♂ 37·3–42·7. Persia : Faragan 2 ♂ ; Semnan, 2 ♂."

19. *Tropidauchen onerosa* (Mistshenko).

1951, *Saxetania onerosa* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 6.

" Near to *S. muricata* Mist., differing by the almost straight median carina of pronotum of ♀ and by broadly rounded posterior margin of the subgenital plate of ♀. Length of body ♀ 53·7–60·7. N. Persia : Torbete-Heidar, 2 ♀."

20. *Tropidauchen muricata* (Mistshenko).

1951, *Saxetania muricata* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 7, 8.
1951, *Saxetania muricata muricata* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 7.
1951, *Saxetania muricata femoralis* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 8.

" Together with *S. onerosa* Mist., resembles *S. cultricollis* (Sauss.), *S. enoda* Mist. and *S. bactriana* Mist., from which the two first differ by the almost smooth anterior part of the vertex in both sexes. Nearest to *S. onerosa* Mist., but differs by the arched median pronotal carina in both sexes, and by the posterior margin of the female subgenital plate, bearing a rounded median projection. Length of body ♂ 30·6–44·8, ♀ 62·7–79·5. N. Persia : Torbete-Heidar, 1 ♀ ; N. Khorosan, 2 ♂, 1 ♀ ; Central Khorosan, 1 ♂ (type), 1 ♀.

" Subsp. *Mur. muricata* Mist. 3rd, 6th, 7th segments of male antenna rectangulate ; length of every segment distinctly greater than its maximal width. First abdominal tergites in ♀ without teeth. Length of body ♂ 44·8, ♀ 79·5. N. Persia, Central Khorosan, 1 ♂ (Type). 1 ♀.

" *S. muricata femoralis* Mist. Differs from *S. m. muricata* Mist. by the transverse 3rd, 6th and 7th antennal segments of ♂, length of each segment being distinctly less than its maximal width, and by the median carina of the first abdominal tergites of ♀, with acute teeth. Length of body ♂ 30·6–35·2, ♀ 62·7–68·4. N. Persia : Torbete-Heidar, 1 ♀. N. Khorosan, 2 ♂, 1 ♀."

21. *Tropidauchen enoda* (Mistshenko).

1951, *Saxetania enoda* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 9.

" Near to *S. cultricollis* Sauss. and *S. bactriana* Mist. Both *S. enoda* and *S. bactriana* differ from *S. cultricollis* by the vertex with distinctly angulate

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PLATE 1.

FIGS. 36–45.—36, *T. miramae*, ♂. 37, ditto, ♀. 38, *T. uvarovi*, ♂. 39, ditto, ♀. 40, *T. cultricolle*, ♂. 41, ditto, ♀. 42, *T. securicolle*, ♂. 43, ditto, ♀. 44, *T. marginatum*, ♂. 45, ditto, ♀.

PLATE 2.

FIGS. 46–57.—46, *T. escalerai*, ♂. 47, ditto, ♀. 48, *T. nizwai*, ♀. 49, *T. sabulosum*, ♀. 50, *T. elbursianum*, ♀. 51, *T. dehbidi*, ♂. 52, *T. edentulum*, ♂. 53, ditto, ♀. 54, *T. popovi*, ♂. 55, ditto, ♀. 56, *T. aelleni*, ♂. 57, ditto, ♀.

The genus *Tropidauchen* Saussure

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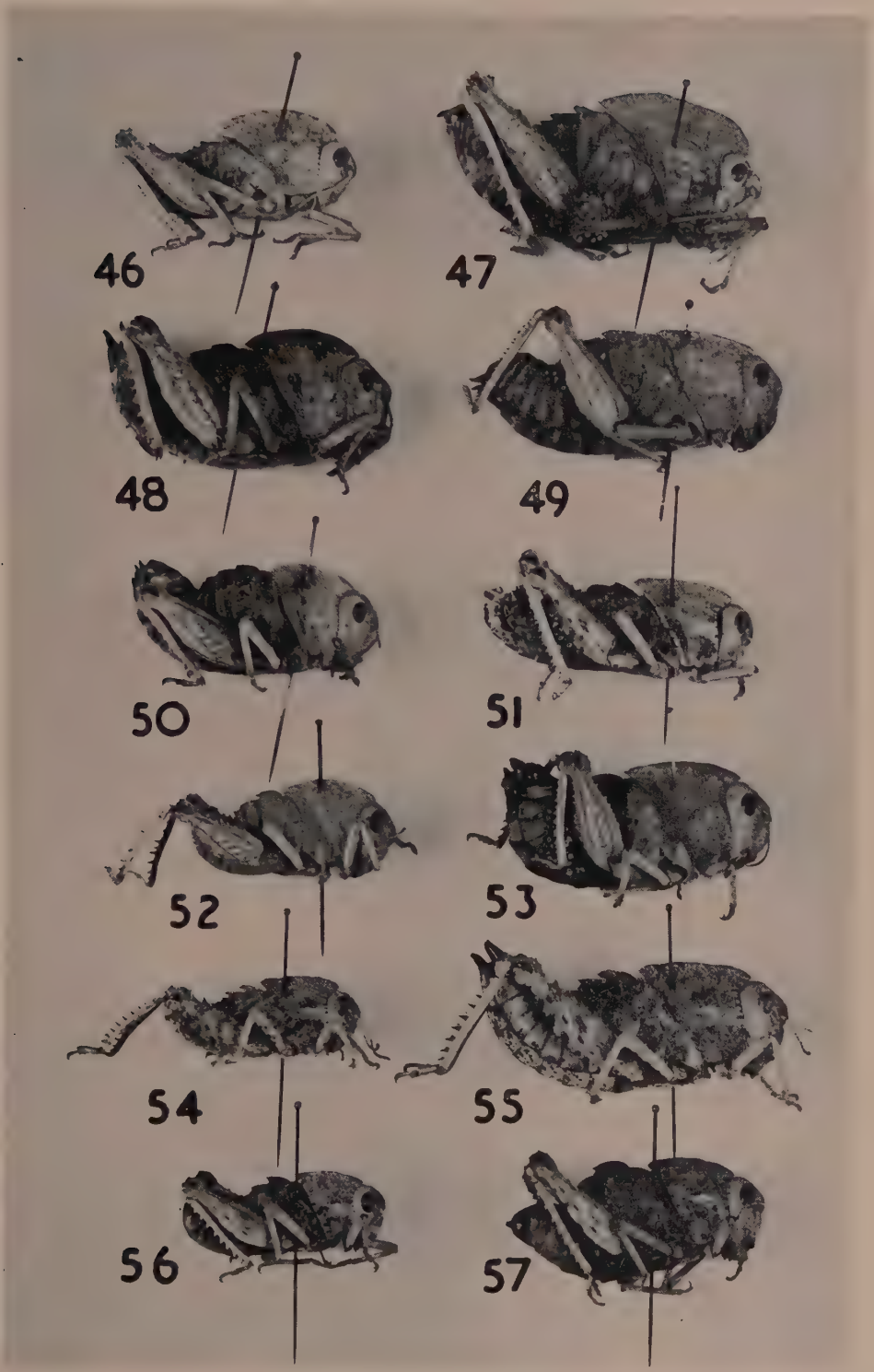

The genus *Tropidauchen* Saussure

margins in both sexes and in the ♀ by the occiput, with a single raised ray. Differs from *S. bactriana* by the absence of apical teeth on the first and the second abdominal tergites in the ♀, and by the mesosternal interspace in the ♂, the minimal width of which is considerably greater than its length. Length of body ♂ 27·5–29·8, ♀ 53·7. South Uzbekistan, Mountains Kuh-i-Tang, Shirdshan, 2 ♂, 1 ♀."

22. *Tropidauchen bactriana* (Mistshenko.)

1951, *Saxetania bactriana* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 739, f. 10.

" Extremely close to *S. enoda* Mist., differing by the first two abdominal tergites in ♀, with sharp teeth, and by the mesosternal interspace in ♂, the minimal width of which is equal to its length in the ♂. Length of body 27·5–30·7, ♀ 48·4–54·6. South Uzbekistan : Hissar Mountains, Kzyl-Tam and Khan-Takhta, 8 ♂ (incl. type), 10 ♀. Kok-Tuga, 1 ♂, 1 ♀."

23. *Tropidauchen scutata* (Mistshenko).

1951, *Saxetania scutata* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 740, f. 13.

" Differs from all species of the genus by the doubly excised apex of the prosternal tubercle in both sexes. Length of body ♂ 27·5, ♀ 46·5. South Turkmenia, Karakala, 1 ♂, (Type). 1 ♀."

24. *Tropidauchen decumana* (Mistshenko).

1951, *Saxetania decumana* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 740, f. 14.

" Together with *S. spinosa* Mist. and *S. irrasa* Mist. differs from all species of the genus by the sharply bifurcate prosternal tubercle in both sexes. From *S. spinosa* Mist. and *S. irrasa* Mist. differs by the strongly developed upper part of pronotum of ♂, which almost reaches the middle of the vertex ; by bi-tuberculate apex of the subgenital plate and serrated base of the external lower margin of the lower ovipositor valve of ♀. Length of body ♂ 43·3, ♀ 64·5. N. Persia, S.E. Khorosan : S.W. of Lake Dak-i-patargan, 1 ♂ (type) and Khouz-Misafir, W. of Namaskar, 1 ♀."

25. *Tropidauchen spinosa* (Mistshenko).

1951, *Saxetania spinosa* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 740, f. 15.

" Near to *S. irrasa* Mist., differing by the sparsely punctured base of the hind tibia in both sexes, and by the first three abdominal tergites with a sharp apical tooth in both sexes. Length of body ♂ 28·5–32·5, ♀ 51·6–54·6. N. Persia : Shahrud, 7 ♂, 4 ♀."

26. *Tropidauchen irrasa* (Mistshenko).

1951, *Saxetania irrasa* Mistshenko, *C.R. Acad. Sci. U.S.S.R.* **77** : 740, f. 16.

" Nearest to *S. spinosa* Mist., differing by the coarse and densely punctured base of the hind tibia of the ♀, and by the absence of an apical tooth on the first three abdominal tergites. Length of body ♀ 47·2. N. Persia : Meshed, 1 ♀."

ON THE EUROPEAN SPECIES OF THE GENUS *ODINIA* R.-D. (DIPTERA: ODINIIDAE).

By J. E. Collin, F.R.E.S.

The species of *Odinia* are small grey flies with abdomen sprinkled or mottled with brownish or blackish markings, and crossveins of wings often more or less infuscated. Frons with three strong orbital bristles, the two upper ones reclinate, but the lower one incurved, frontalia often hairy but without distinct cruciate bristles, postvertical bristles (behind ocellar triangle) divergent. Thorax with five pairs of dorsocentral bristles, mesopleurae bare. Abdomen with five distinct prehypopygial segments. Wings with only one costal "break," close to end of first vein, anal cell and anal vein distinct. Hind legs of male remarkably stout.

The generic name *Odinia* was first proposed by Desvoidy in 1830 for two new species, *trinotata* and *peleterii*, but as he only doubtfully included the latter in the genus, the former represents the type. In the same year Meigen described a genus *Milichia* based on two new species, *speciosa* and *maculata* (since considered to belong to distinct genera), the former being designated as its type by Westwood in 1840. Because the second species (*maculata*) has generally been accepted as identical with Desvoidy's *trinotata*, and Meigen's *Syst. Beschr.* of 1830 is always granted priority over Desvoidy's *Essai* of 1830, the name of the type of *Odinia* becomes *maculata* Mg.

This use of the names *Milichia* and *Odinia* was not adopted for several years owing to the action by Loew in 1843, when revising the species of *Milichia*, of limiting that generic name to *maculata* Mg., and indicating that *speciosa* Mg. corresponded to a description given by Latreille of an unnamed species for which that author had in 1829 proposed a generic name *Argyritis* (incorrectly quoted by Loew as *Argyrites*), a name which was in fact a homonym of *Argyritis* Hübner (1816). However, Rondani, who in 1856 had (like Westwood) used the name *Milichia* for *speciosa* Mg., in 1875 revived the name *Odinia* Dsv. for *Milichia* Lw. *nec* Mg., but did not sink *trinotata* Dsv. as a synonym of *maculata* Mg. because of certain omissions in Meigen's description, and by modern Rules of Nomenclature any genus with *trinotata* Dsv. = *maculata* Mg. among its included species must be known as *Odinia* Dsv.

At present only two European species are recognized in this genus, and specimens of these are by no means common in collections, apparently owing to the fact that species of the genus seldom occur far away from certain isolated situations where a combination of necessary factors provide suitable breeding places. This dearth of specimens is probably the reason why several closely allied but distinct species have been treated as variations, and why the two names *maculata* and *boletina* Zett. have so often been used by different writers for several distinct species.

Having been fortunate enough to study a considerable amount of material from various sources, I have satisfied myself that there are at least six distinct species in Europe, four of which have been found in Britain, and some interesting

facts have been brought to light concerning the life-histories of some of them. My best thanks are due to the authorities of the National Museums of France, Germany, Austria and Holland for their valued co-operation, without which this paper would never have been written. I am especially obliged to M. Séguy of the Paris Museum for sending to me one of the two original types of Meigen's *M. maculata*, which I found to agree in all respects with two co-types of this species in the Winthem Collection in Vienna.

O. boletina Zett. is to be found on large fleshy fungi growing on Poplar trees. The other species would appear to be associated with wood-boring beetles occurring in *Salix*, *Populus*, *Ulmus*, *Alnus* and *Quercus*, probably in *Betula*, and possibly in other trees. They should be sought on trees so affected, especially where the damage has caused sap to flow.

The European species known to me may be tabulated as follows :

1 (2) Antennae (including basal joints) entirely yellow, at most third joint with only a faint brownish patch. Thorax with only an indistinct lateral (notopleural) brown stripe, and crossveins of wings only slightly clouded . . . . . **xanthocera** sp. n.

2 (1) Antennae with basal joints, or at least second joint, to a large extent brownish or black, usually greyish above, more rarely second joint with yellowish end-margins

3 (8) Frons with a few small hairs near eye-margin between the posterior orbital and the vertical bristles. Larger species.

4 (5) Eyes very distinctly hairy (though shorter haired in female than in male). Frons distinctly yellowish in front, and more universally and distinctly dark haired, including some on that part between ocellar triangle and eyes. Frontal lunule yellowish, and microscopically hairy above. Middle tibiae with only one long apical spur. Male hind tarsi not dilated towards tip **hendeli** sp. n.

5 (4) Eyes only microscopically hairy. Frons without small hairs between ocellar triangle and eyes except for a very few near eye-margin, and not distinctly yellowish in front. Middle tibiae with two long spurs of practically equal length. Male hind tarsi dilated towards tip.

6 (7) No median brown stripe on thorax, and only faint stripe on inner side of each row of dorsocentral bristles behind. No lateral (notopleural) brown stripe. Frontal lunule larger and yellowish, though somewhat dusted greyish. Second antennal joint with yellow end margins. Crossveins not conspicuously infuscated **czernyi** sp. n.

7 (6) A narrow median brown stripe and another down each line of dorso-central bristles, as well as a distinct brownish notopleural stripe on thorax. Palpi dusky towards tip, especially in male. Frontal lunule brownish. Second antennal joint all dark. Crossveins strongly infuscated . . . . **maculata** Mg., var. **loewi** var. n.

8 (3) Frons absolutely without hairs near eye margin between posterior orbital bristle and vertical bristle. Usually smaller species.

9 (10) Darker species resembling var. *loewi* above. Disc of thorax with ill-defined brownish stripes and a distinct lateral (notopleural) stripe. Palpi darkened. Frontal lunule dusky. Middle tibiae with two spurs subequal in length . . . . . **maculata** Mg.

10 (9) Disc of thorax entirely dull greyish without complete lateral (notopleural) stripe, though sometimes indications of the commencement of one behind humeri. Palpi yellow. Frontal lunule yellow, but dusted greyish. Middle tibiae with one long and one short spur.

11 (12) Frons very obviously yellow in front. Crossveins, especially outer one, more distinctly infuscated, the cloud usually more concentrated on a patch about middle of the crossvein. Acrostichals irregular . . . . . **meijerei** sp. n.

12 (11) Frons at most only very narrowly yellow on extreme front margin. Crossveins, especially outer one, only very narrowly and indistinctly (or not at all) infuscated. Acrostichals more regularly in lines . . . . . **boletina** Zett.

Odinia xanthocera sp. n.

Easily recognized by the entirely yellow basal joints of the antennae.

♂. Frons entirely grey, not darker but slightly more yellowish-grey on middle part; ocellar triangle dusky; a few small brownish hairs scattered over front half (or less), and *on* ocellar triangle, but none at side between upper orbital and vertical bristles. Lunule grey, but more yellowish-grey than face. Palpi, proboscis and antennae (including both basal joints) yellow. Third antennal joint small, with only a small brownish patch towards tip above, which may sometimes be very indistinct. Thorax light grey, sometimes humeri and tip of scutellum beneath slightly yellowish. Upper (triangular) corner of notopleural depression faintly brown, this colour more distinct on the narrow band of small setae in front of posthumeral bristle and about base of supra-alar bristle. The usual two brown stripes present on pleurae. Acrostichals irregular, in six to eight rows, less numerous in front and behind, and ending in a pair of longer prescutellars.

Abdomen grey, only slightly brownish about middle of first two tergites, the usual pairs of spots on tergites 3–5 brown, and middle and outer pair on third tergite *not* connected together in any way. Hairs and bristles arising from only very small brownish-black spots. Legs mainly yellowish, front coxae brownish-yellow, front and hind femora somewhat brownish with only just the tip clear yellow. Brownish rings on tibiae not very defined, especially the apical one. Tarsi yellowish, becoming browner towards tip. Anteroventral spur to middle tibiae only half length of ventral one. Hind femora and tibiae very short and stout. Hind tarsi rather longer than tibiae, with each joint becoming successively wider towards tip until fourth joint at tip is about twice as wide as base of first joint; fifth joint not so wide and rather longer than wide at tip; fourth joint with numerous brownish-black bristles on a projecting rim beneath, which (with the rim) protect the whole of underside of fifth joint up to base of pulvilli.

Wings very much as in *boletina*; middle crossvein only very faintly infuscated though the actual vein itself is darkened, and outer crossvein scarcely at all either infuscated or darkened, distance between crossveins rather less than length of last section of postical vein, which only faintly reaches wing margin. Basicosta, squamae and halteres yellow.

♀. Very similar to male except for the usual sexual differences. Front and hind femora usually less darkened, and hind tarsi normal.

Length about 3 mm.

There should be no fear of confusing this species with *boletina* because the latter not only has dark basal antennal joints but the frons is also darker except on the orbits, and the abdominal spots are larger and blacker with a distinct tendency for the inner and outer pairs on the third tergite to be connected on their lower margins, and the male hind tarsi are not so much dilated.

This is the species which has been bred in Holland from the mines of *Cryptorhynchus lapathi* L., and a full description of the larva was published by B. de Vos-de Wilde (1935, *Proefschr. Univ. Amsterdam*). I have seen a male from de Meijere's Collection which was so bred labelled (Baarn, 9.vi.32), and another male in better condition from Riedel's Collection in Berlin, apparently found in association with "*Saperda populnea*," while there are three females in the Berlin Museum, two of them in Loew's Collection, one labelled "*maculata* det. Becker" and "An ausgetretenem Weidensaft in bot. Garten Juni 59," the other under Loew's series of "*Milichia formosa*," and the third in Becker's Collection taken by Kowarz at "Franzbd. 6.1903." It has not yet been found in Britain.

Odinia hendeli sp. n.

Species with eyes and frons more distinctly hairy than usual, the latter with hairs even between ocellar triangle and eyes, and distinctly yellowish in front.

♂. Frons broadly yellow in front, and very extensively black haired, with hairs present even opposite ocellar triangle, lunule yellowish and bearing microscopic hairs. Black patch on third antennal joint rather smaller than usual. Arista yellowish except towards tip. Thorax without darker stripes, even notopleural stripe scarcely indicated except perhaps in front of posthumeral bristle. Acrostichal bristles rather thickly and irregularly placed in 8–10 rows, and microchetae outside dorsocentral bristles more numerous than usual. Humeri and margin of scutellum yellowish, pleural sutures and prothorax considerably yellowish, some indication of a yellow hind margin to fourth and fifth tergites, and hypopygium with a yellowish tinge. (It must be remembered, however, that the specimens were bred.) Legs extensively yellowish, including front coxae and all tarsi; middle tibiae with only *one* long distinct apical spur. Wings with crossveins distinctly infuscated. Hind tarsi of almost equal width throughout.

♀. Very similar to the male in all respects.

Length about 4 mm.

This is the species which Hendel in 1911 distinguished from *O. boletina* Zett. under the name *maculata* Mg. I have examined the specimen (a female) in his collection at Vienna which is numbered 26569 and labelled "*Milichia maculata* Mg. det Hendel," and it is a female of the above described species and not of *maculata* Mg. There is another female in the Berlin Museum (Riedel Coll.) labelled "Schönebeck 7.6.25," and "*O. maculata* det Riedel & Hering." It is a very distinct species which was bred early in 1936 by Dr. George Salt of the Zoological Museum, Cambridge, from larvae found in the rotting (but not thoroughly decayed) wood of a large elm tree which had been felled at Cambridge during the previous winter. These larvae were associated with larvae and adults of the Oedemerid beetle *Ischnomera caerulea* L., and the flies began to emerge at the end of March. Dr. Salt's specimens (with the exception of two males given to me) were presented to the Cambridge University Museum of Zoology in 1940, but were mislaid during the war years and unfortunately have not since been found. There are, however, three other males in that Museum, taken at Cambridge in July, 1906 and 1908, by Francis Jenkinson.

Odinia czernyi sp. n.

♂. Frons only yellowish on extreme front margin, with fine hairs darker and more numerous at sides between fronto-orbital bristles and eyes, including a few between posterior orbital and vertical bristles, though none each side of ocellar triangle. Frontal lunule broader, of a yellowish ground-colour. Eyes microscopically hairy, not so obviously and

densely hairy as in *hendeli*. First antennal joint yellow, second brownish, but with obvious yellow hind margin on inner side ; third with brownish patch beyond base of arista which does not extend to end of joint, nor reach to its base. Arista yellow on basal joints, and for some distance beyond. Palpi slightly dusky towards tip and rather strongly bristled. Thorax with broad but faint brownish stripes behind, on inner side of dorsocentral bristles. No lateral notopleural or median stripe, but in front with a pair of slightly darker grey stripes, one on each side of the two middle rows of acrostichals. Tip of scutellum yellowish.

Abdomen with the posterior margin of the two brown patches on each side of third tergite connected by a brownish line, but those on fourth and fifth tergites isolated. Bristles and hairs arising from quite small blackish spots, not from rather larger spots as in *maculata*. Acrostichals numerous in 8–10 rows, and numerous microchetae between dorsocentrals and sides of thorax.

Legs yellowish, including front coxae ; front femora slightly, hind femora more intensely brownish, the latter and their tibiae very stout ; tibial brown bands not very conspicuous. Middle tibiae with two apical spurs of almost equal length. Hind tarsi considerably dilated towards end, widest at end of the deeply bilobed fourth joint.

Wings with the crossveins not very broadly infuscated, very much as in *meijerei*.

Length about 4 mm.

Described from one male in the Vienna Museum, Coll. Czerny, as *O. maculata* Mg., from "Austr. sup., 11.vii." Rather like a large *O. meijerei* with which (except where otherwise stated) it is compared in above description.

Odinia maculata Meigen.

A species with more conspicuous brownish markings on thorax and abdomen, and darker legs.

♂. Frons seldom with a slight yellowish tendency on front margin only. Antennae more extensively darkened, the dark patch on outer side of third joint extended to base of joint. Arista only yellow on basal joints. Lunule not very broad, slightly brownish in contrast to white dusted face.

Thorax with a narrow median brown stripe and a similar stripe down each row of dorsocentrals ; behind the suture the latter widens out to occupy one-third of the space between those rows, with a tendency to coalesce in front with the median stripe, which does not extend beyond suture. The stripe from above humerus, to (and including) postalar callus, together with the two pleural stripes, usually very distinct. Scutellum a little brownish about middle.

Abdominal lateral dark patches on tergites 3 and 4 with a distinct tendency to be united on the line of their lower margins. Legs, especially in male, much darker than usual, only the knees and small basal ring on each tibia distinctly pale ; lower pale tibial ring less distinct. Tarsi brownish, only extreme base of each joint yellowish. Hind tarsi of male very little dilated, fourth joint strongly bilobed. Wings with crossveins very obviously infuscated, somewhat wider apart than length of outer one, and very nearly as far as length of last section of postical vein. The small dark cloud on upper side of discal vein just beyond base of discal cell mentioned by Loew may be present or absent, or present on one wing only.

♀. Similar to male except for usual sexual distinctions. In this and all other species the third antennal joint is slightly larger in females than in males.

Length about 3 mm.

The following specimens of this species have been examined and compared : A male type (No. 2515) in Meigen's Collection in the Paris Museum, also bearing a round label with the numbers " 2713 " and " 40 " upon it. A pair of probable co-types in the Winthem Collection at Vienna, the male labelled " Holsatia " and the female " Lyon." A female in Hendel's Collection at Vienna labelled

" Jacobsdorf, Hungaria 3.6.15, Zerny." Two pairs in Loew's Collection at Berlin, one pair being his two smaller specimens of 1843, a headless female labelled " Scheiting, 12.6.51," and a male dated " 9.5.58 " among his series of *Milichia formosa*. A female in Riedel's Collection (Berlin) labelled " Urdingen 12.5.09," and " *O. boletina* det. Hering." Finally I captured a pair in 1939 on a *Cossus*-infested oak tree in the New Forest (Hants.), the female on 26th May, and the male on 4th June. There is also a female in the British Museum Collection taken at Guestling (Sussex) in June, 1905.

This species is obviously associated in some way with oak trees; the pair of " smaller " specimens recorded by Loew in 1843 as two males were taken on an oak tree by Zeller, and Schiner recorded taking the species on an oak, while, as stated above, my pair were taken on a *Cossus*-infested oak.

Meigen described the palpi as " rothgelb," and abdomen as " mit brauner Ruckenlinie " ; actually in the type examined the palpi are dusky towards the tip beneath, and abdomen *without* a median dark line, but the female co-type in the Winthem Collection labelled " Lyon " has at least some indication of a median stripe on abdomen.

It may be noted that no specimen of *maculata* could be found in Schiner's Collection at Vienna, nor any specimen labelled " *femorata*."

Odinia maculata var. **loewi** var. n.

Very similar to *maculata* Mg., but considerably larger, and microchetae on frons more conspicuous, including 1–2 near eye-margin between upper orbital and vertical bristles. Eyes only microscopically pubescent, and Riedel's male is labelled "Augen 2 Binden." Palpi rather more densely bristled than usual (except perhaps in *hendeli*), and somewhat variable in extent of infuscation (apparently less infuscated in female). Scutellum somewhat brownish except at sides. *No* small dark cloud above base of discal cell.

Length about 4 mm.

Specimens examined : One male in Loew's Collection described by him in 1843 as a large female of *maculata*, a pair in Riedel's Collection from " Frankfurt Od.," the male taken on 30.v.38, the female on 20.v.35, "An Eichenfluss," and one male in the "Alte Sammlung " Vienna, labelled " *maculata*." It does not appear to have been taken in Britain.

Odinia meijerei sp. n.

Resembling boletina, *but crossveins of wings distinctly infuscated, and frons broadly yellowish in front.*

♂. Frons with only very fine pale hairs on front half only. Lunule whitish with a slight yellowish tint. Palpi yellow. Arista yellow for more than one-third from base. Disc of thorax uniformly grey, no notopleural brown stripe, at most only upper triangular area of notopleural depression slightly brownish. Pleurae with a silvery-grey band between the upper brown stripe and the darker grey sternopleura and rest of lower half of pleura.

Abdomen with dark markings and small spots at base of bristles not very conspicuous, and only the pair of former on each side of third tergite connected. Legs extensively yellow (but variable), at least hind femora and tibial rings darkened, four anterior tarsi entirely yellow, and only last one or two joints of hind tarsi brownish, front (especially) and middle femora often dusky beneath. Hind tarsi considerably dilated towards tip, fourth joint widest, strongly bilobed, and with underside produced beneath fifth, which is a little longer than wide at tip. Middle tibiae with anteroventrol spur considerably longer than the one behind it.

Wings with the usual dark markings and infuscated crossveins, the infuscation on outer crossvein usually enlarged into a patch at middle of that crossvein, and this vein less distant from middle crossvein than length of last section of postical vein. Halteres yellow.

♀. Similar to male, but (as usual) hind legs less stout, and hind tarsi longer and not dilated.

Length about 3 mm.

There should not be much difficulty in distinguishing this species from *boletina*; a specimen of the former with only slightly infuscated crossveins would certainly be an immature one and have front of frons *very obviously* yellow, while a specimen of *boletina* with rather distinct infuscation would be a fully mature one with unicolorous grey frons. For other distinctions see under *boletina*.

O. meijerei is to be found on diseased elm trees. There are a number of specimens in the Cambridge Museum Collection taken in or near Cambridge, and the Rev. Canon L. W. Grensted has found it at Oxford. There is a female in the British Museum from Buckhurst Hill (Essex), and another from Letchworth (Herts.). A female taken by myself at Chippenham Fen (Cambs.) had in life only one reddish stripe across the middle of the eye, much as quoted by Zetterstedt for *boletina*. This is the species recorded by de Meijere from Holland (1935, *Tijdschr. Ent.* **78** : 218) as *O. maculata*, according to three females labelled " Hillversum, VIII. Reclaire," which were taken on the trunk of an elm tree infested with *Scolytus scolytus* F., and a specimen recorded by Meijere on the same occasion from " S'Hage i. dun. VII " is another female of the same species. There are, however, no specimens in the Collections of the Berlin or Vienna National Museums unless a damaged male in the former labelled " Gleiwitz 15.8.31 " is this species, but there was a female from "Asch " (Bohemia) in Kowarz' Collection, and a headless female without history in Bigot's Collection, both under the name of *M. ornata* Zett.

Odinia boletina Zetterstedt.

Very similar to *O. meijerei* but crossveins of wings, especially outer one, at most only very indistinctly infuscated, and frons more uniformly greyish. The two middle rows of acrostichals on thorax are more uniformly biserial, and there is a difference in the dilated hind tarsi of the male. In both species the fourth joint is considerably excised at tip on its upper margin to admit the base of the fifth joint. In *meijerei* the fourth joint extends on each side of the fifth to quite one-half the length of this latter, and the fifth joint is rather longer than wide. In *boletina* the fourth joint does not extend so far along each side of fifth, and the fifth is shorter and broader, about as long as wide at tip.

Length on an average somewhat less that in *meijerei*.

This species is not uncommon in the New Forest (Hants.) on a species of fungus growing on Poplar trees, and I have seen it from Crowborough (Sussex) and Ullswater (Lake District). In Continental collections there are more numerous specimens of this species than of any other.

O. ornata Zett., which has been considered (certainly incorrectly) to be a synonym of *maculata* Mg., will probably prove to be a distinct species (more like *meijerei*) associated with Birch trees (*Betula*), and a single female taken by me on a Birch tree at Barton Mills (Suffolk) on 21.vii.49 may be that species, but until additional material is forthcoming, and Zetterstedt's type has been examined, this must remain doubtful.

THREE NEW SPECIES OF BRITISH APHIDS.

By H. L. G. Stroyan, M.A., F.R.E.S.

1. **Sappaphis sphondylii** sp. n.

Colour Notes.

In life a typical "*Sappaphis* grey" owing to a slight coat of wax powder; after denudation in alcohol the body is of a mottled dark green and pale ochreous colour, with sclerotic parts blackish.

Microscopic Morphology.

Apterous viviparous female (*alatiform*): *Body* large, broad oval, 2·19–2·64 mm. long. *Head* sclerotic, ocellar vestiges not well developed. *Frons* rather sinuate, frontal and occipital hairs long and acute. *Antennae* 1·13–1·30 mm. long, rather less to rather more than half body length; joint III with 21–49 secondary rhinaria, which are somewhat tuberculate, distributed along whole length; joint IV with 3–16 similar rhinaria along whole length; joint V without rhinaria apart from the primary. *Antennal hairs* on joint III with observable maximum lengths from 45μ–55μ, the mode being at 48μ. *Rostrum* reaching about to posterior coxae, apical joint normal, similar to that of *S. lauberti* (Börner), 0·18–0·19 mm. long, with only one pair of hairs proximal to the 3 constant apical pairs. *Thorax* without any appreciable sign of alatiform sclerotic development; in 6 specimens out of 9 with a complete set of pairs of marginal tubercles on all three segments; the remaining 3 specimens have one unpaired tubercle on the mesothorax, but complete pairs on the pro- and metathorax. One specimen has an unpaired spinal tubercle on the pronotum; otherwise spinal tubercles are absent from the thorax. *Abdomen* with sclerotic pattern consisting of transverse bars on segments 6–8 inclusive, and small paired spinal and spino-pleural scleroites on the more anterior segments and small marginal sclerites surrounding the marginal tubercles. There is no gradual transition in size from the complete transverse bars of the posterior segments to the small scleroites of the anterior segments, as occurs in most other species of *Sappaphis*, including *S. lauberti*; but in two specimens there is a general tendency over the whole abdomen for the scleroites to elongate and fuse transversely, which results in a rather complete series of broken transverse bars. There is no tendency for the number of spinal scleroites to be increased as in *S. lauberti*. *Marginal tubercles* are present on abd. 1–7 inclusive, moderate to rather small in size. *Spinal tubercles* very small to small, in 8 out of 9 specimens only on abd. 8, the ninth specimen with a single one also on 7. *Dorsal abdominal hairs* very much shorter than antennal and frontal hairs, about 15–20μ long, acute but not fine-pointed as in *lauberti*. *Marginal hairs* variable, some being long, fine-pointed and acute, others shorter and less acute; the shortest being about one-third, the longest about 3 times the greatest diameter of the marginal tubercles on their respective segments. *Ventral hairs* acute, variable in both length and distribution, from rather few to rather numerous; much finer than dorsal hairs. *Siphunculi* of moderate length, 0·24–0·28 mm., subcylindrical, dark sclerotic and normally imbricate; with a moderate apical flange but no noticeable subapical circumcision. *Cauda* normal for genus, 0·11–0·12 mm. long, with (4 ?) 5–6 hairs. *Subgenital plate* with a single pair of long, fine hairs at the anterior margin and an irregular double or triple row of shorter, spinier hairs along the posterior margin. *Body cuticle* generally plain and colourless, but one specimen shows a faint but distinct reticulation. *Legs* uniformly rather pale sclerotic, slightly darker at apices of femora, with normal fairly long, acute hairs; 2nd joint of hind tarsi 0·14–0·15 mm.

For biometric data see Table I.

Biometric Data.

Table I.—*Measurements of type series of* Sappaphis sphondylii *sp. n.*

(All lengths in mm. unless otherwise indicated; antennae measured without joints I and II.)

Body.	Ant.	Joint ratios (III–VI).	Siph.	Cau.	Cl. hrs.	A.j.r.	2.h.t.	Rh./L. III./IV.	Rh./R. III./IV.	Hair maxima. Ant. 3.	Hair maxima. Abd. 3.
2·48	1·14	24:12½:8½:7+19	0·26	0·12	5	0·18	0·14	29/11	36/12	48μ	19μ
2·50	1·20	25½:13:9:6½+21	0·26	0·11	6	0·18	0·14	29/7	32/11	48μ	19μ
2·64?	1·18	25:12:10:7+20	0·27	0·12	4?	0·18	0·14	21/7	22/3	45μ	19μ
2·62	1·22	27:13½:9½:6½+20	0·27	0·11	5	0·18	0·14	36/16	37/13	48μ	19μ
2·43	1·29	26:15:10:7+21½	0·28	0·12	5	0·18	0·14	34/9	31/10	55μ	16μ ?
2·45	1·13	24:11:9:7½+19	0·27	0·11	5	0·18	0·14	26/6	26/5	48μ	19μ
2·19	1·22	27:13:10:6+20	0·24	0·11	5	0·18	0·14	49/13	43+/-	48μ	19μ
2·38	1·30	26:15:10½:6½+23	0·27	0·11	6	0·19	0·15	42/8	41/7	48μ	19μ
2·59	1·18	25:12½:9½:6½+20	0·26	0·11	5	0·18	0·14	33/9	30/10	45μ	19μ

Type material: 9 apterous viviparous females. East Lothian: North Berwick, taken from *Heracleum sphondylium*, vi.1950 (*H. L. G. Stroyan*); in the author's collection.

Biology.

Similar to that of the exules of *Sappaphis lauberti* (Börner), with which the specimens were confused until after they had been mounted. The aphids were living basally on *Heracleum sphondylium* on sand-hills near the sea, and were attended by ants. All nine specimens are of a very constant alatiform type; no typical apterae or alatae were found. No evidence for or against heteroecy to a primary host among the Rosaceae is available at present, except for the strong morphological relationship with *S. aizenbergi* (Shaposhnikov), to be discussed under "Systematic Position," which suggests that the species may be holocyclic on *Heracleum*.

Systematic Position.

Sappaphis sphondylii may be distinguished from *lauberti* and all related species, with the exception of *S. radicicola* (Mordvilko) and *S. brancoi* (Börner), by the correlation of constant marginal tubercle pairs on the 7th abdominal segment with the length relationship of the hair-length maxima on the IIIrd antennal joint and the spine of the 3rd abdominal tergite (about 48μ/19μ in *sphondylii*, subequal with the abdominal hairs generally slightly the longer in *lauberti*). The apterae of *S. radicicola* have a rather similar combination of characters, but apart from the rarity of alatiforms in *radicicola* the following differences may be noted: (1) the range of the hair-length maxima on ant. III in *sphondylii* is 45μ–55μ, in *radicicola* 23μ–36μ; (2) marginal tubercles are typically absent from the meso- and metathorax in *radicicola*; the marginal tubercles are also uniformly rather larger and flatter on the posterior abdominal segments in *radicicola* than in *sphondylii*; (3) there are consistently 2 pairs of hairs on the proximal half of the apical rostral joint in *radicicola*, and only one pair in *sphondylii*. The characters of *S. brancoi* from *Pyrus malus* and *Valeriana officinalis* are also rather similar, and here the apterous viviparous females are for the most part alatiform; but, while the length of the antennal

hairs is rather variable, they do not exceed 30μ, and the distribution of the rhinaria on the antennae of the alatiforms tends to be apical on the third joint and along the fourth, spreading progressively proximad as alatiformity becomes more pronounced. The forms on *Valeriana* also have the marginal tubercles

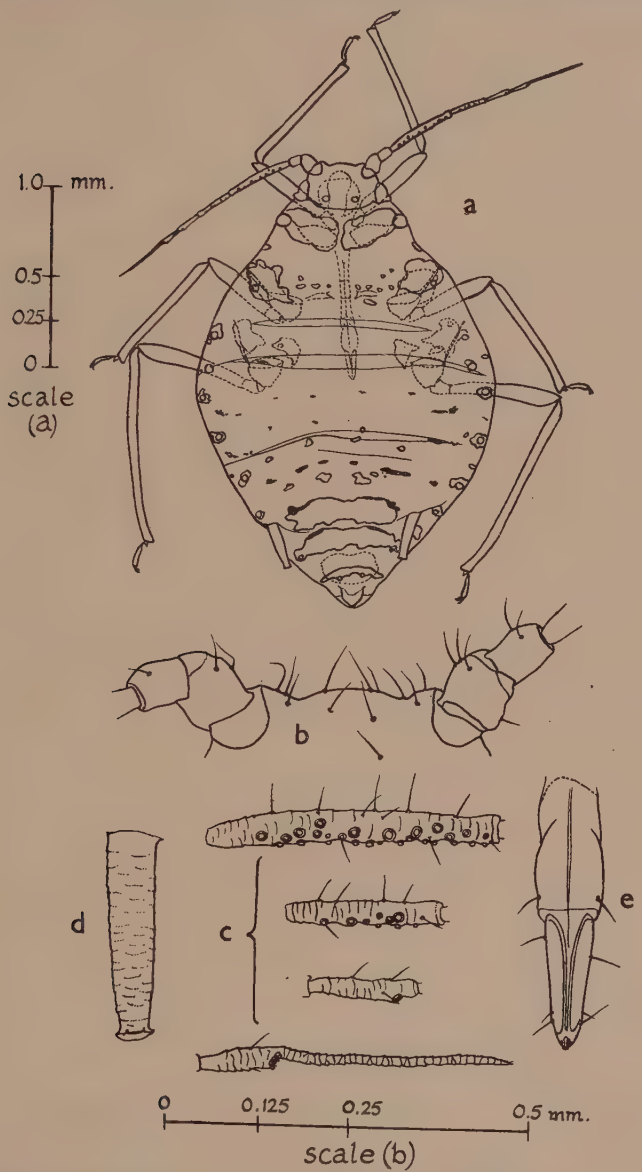

FIG. 1.—*Sappaphis sphondylii* sp. n. *apt.viv.* ♀. (*a*) Holotype (projector drawing from cleared specimen). (*b*) Frons and first two antennal segments, further enlarged. (*c*) Antennal joints III to VI. (*d*) Siphunculus. (*e*) Apical rostral joint. Figs. (*c*) to (*e*), scale as for (*b*).

Scales of all figures are indicated by the millimetre scales (*a*) and (*b*) given on each group.

of the abdomen very large and flattened, and those on *Pyrus*, while having the tubercles smaller, still have them larger than those of *sphondylii*.

TABLE Ia.—Statistics of type series of *S. sphondylii* sp. n.

(Lengths in mm.)

	Body.	Antenna.	Siphunculus.	Rhinaria on Ant. III.	Rhinaria on Ant. IV.
Mean	2·48	1·21	0·26	32·59 (33)	9·23 (9)
Standard deviation . .	0·1393	0·0591	0·0123	7·267	2·937
Standard error of mean. ± .	0·0464	0·0197	0·0041	1·762 (based on $\bar{x} = 33$)	0·712 (based on $\bar{x} = 9$)

The closest affinities of *sphondylii* are apparently with *Sappaphis aizenbergi* (Shaposhnikov). This species was described by Shaposhnikov (1949) from the basal parts of *Heracleum sibiricum*, on which it is holocyclic, in the Leningrad district. The description agrees in many respects with that of *sphondylii*; but there are two constant differences to be observed: (1) in *aizenbergi* the hairs on the third antennal joint are short, only about 0·3 of the joint diameter, while in *sphondylii* they are longer than the diameter, fine and acute; and (2) the rhinarial numbers for the antennal joints of the summer apterae differ in the two species, being quoted as 10–15 (4–26) on III and 1–2 (0–6) on IV in *aizenbergi*, while in *sphondylii* the observed figures are 21–49 on III and 3–16 on IV, a number greater even than that quoted for the rather more alatiform apterous gynoparae of *aizenbergi*. It is possible that these two differences, together with the difference of host species, may have only subspecific significance; but as an attempt to make contact with Dr. Shaposhnikov for the purpose of comparing the two forms has been unsuccessful as yet it is preferable to retain *sphondylii* as a good species for the present.

2. **Aphis etiolata** sp. n.

Colour Notes.

Apterae in life pale yellowish-, whitish- or bluish-green, without appreciable pulverulence; siphunculi, apices of antennae and tibiae, cauda and tarsi slightly dusky.

Microscopic Morphology.

Apterous viviparous female: Body rather plump oval, 1·42 to 1·83 mm. long. *Head* pale sclerotic, with a median paler longitudinal stria on vertex. *Frons* weakly convex, hardly at all sinuate. *Cephalic hairs* all minute, acute, similar to antennal hairs. *Antennae* very short, 5- or 6-jointed, scabrously imbricate, with processus terminalis 2·4 to 3 times basal part of joint VI(V); total length of antennae 0·48 to 0·57 mm.; hairs on joint III minute like cephalic hairs, about one-third as long as the articular diameter of the joint. Primary rhinaria small, round, rather deeply sunken. *Rostrum* long, reaching to or beyond 3rd coxae, apical joint long, stoutly built but acute at apex, with sides evenly and gently curved or nearly straight, and with only one pair of short hairs at about two-fifths in addition to the three apical pairs; length of apical joint 0·14–0·15 mm. *Body* without sclerotic pigmented markings other than a broad pale transverse band on pronotum; even that on the 8th abdominal tergite, present in most *Aphis* species, is apparently absent. *Dorsal* and *ventral body hairs* very small, acute, not longer than about half articular diameter

of third antennal joint. *Marginal tubercles* on pronotum, abd. 1 and abd. 7 very large and usually rather flat, the diameter of those on abd. 7 equalling or exceeding the median diameter of the siphunculi. Much smaller marginal tubercles are also variably present on abdominal segments 2–4 inclusive, and very rarely also on 5 or 6. Rarely one of the tubercles on abd. 7 may be duplicated by a smaller one beside it. *Siphunculi* fairly stout, 0·14 to 0·24 mm. long, tapering from base to apex; sclerotic, darkening progressively from base to apex; markedly imbricate, with a very narrow apical flange. *Cauda* normal, dusky sclerotic, 0·11–0·14 mm. long, with 8–13 hairs. *Dorsal abdominal cuticle* posteriorly with a very faint, almost invisible, sculpture of transverse rows of spinules forming a strongly transverse reticulation. *Legs* normal but fairly thick, palish sclerotic, tarsal joints and apices of tibiae somewhat darker; tibial hairs numerous, short, acute, less than half diameter of tibia, except towards apex of hind tibia, where the length increases to about equal to the tibial diameter. Chaetotaxy of first tarsal joints 3.3.2. Rudimentary gonapophyses 3.

For biometric data see Table IIa.

TABLE IIa.—*Measurements and statistics of type series and additional apt.viv.* ♀ *of* Aphis etiolata *sp. n.*

(All length measurements in mm.; antennae measured without joints I and II. Type, paratypes and nos. 5–12 from West Byfleet, Surrey; remainder from Bennekom, Holland.)

Specimen.	Body.	Ant.	Joint ratios (III–VI).	Siph.	Cau.	Cl. hrs.	A.j.r.	2.h.t.
Holotype	1·824	0·528	8:3½:5:4½+12 11:6:4½+12	0·200	0·130	8	0·146	0·093
Paratype	1·792	0·568	7:5:5½:5+13 7:4:6:5+13½	0·224	0·136	10	0·139	0·096
„	1·504	0·568	8:4½:6:5+12 8:4½:5½:4½+13	0·240	0·144	10	0·139	0·096
„	1·712	0·560	7½:4½:5½:4½+13 7½:4:5½:5+12	0·214	0·139	10	0·143	0·093
5	1·70	0·54	7½:4:5½:4½+12	0·19	0·12	8	0·14	0·10
6	1·83	0·57	8:4:6:5+12½	0·22	0·13	9	0·14	0·10
7	1·67	0·56	8:4½:5½:5+12	0·24	0·14	9	0·15	0·10
8	1·68	0·54	11½:6:4½+12	0·22	0·13	10	0·15	0·10
9	1·42	0·50	10:6:4+11	0·18	0·14	8	0·14	0·09
10	1·66	0·50	10:5½:4½+11	0·18	0·12	10	0·15	0·10
11	1·54	0·50	11:5:4+11	0·19	0·12	11	0·14	0·09
12	1·81	0·50	10½:5½:4½+11	0·18	0·13	10	0·14	0·09
13	1·55	0·50	10½:5:4½+11	0·18	0·12	11	0·14	0·09
14	1·74	0·50	11:5:4½+11	0·18	0·12	11	0·14	?
15	1·62	0·51	8:3½:5:4+11½	0·17	0·12	10	0·14	0·09
16	1·82	0·54	(7½:4):6:4½+12	0·20	0·13	10	0·15	0·10
17	1·71	0·51	12:5:4+11	0·18	0·13	9	0·14	0·10
18	1·79	0·56	8:4½:6:4½+12	0·19	0·13	10	0·14	0·10
19	1·57	0·48	10:5:4+11	0·14	0·11	12	0·14	0·09
20	1·73	0·55	7½:5:5½:4½+12	0·21	0·13	9	0·14	0·09

Statistics of type and paratypes of *Aphis etiolata* sp. n.

	Body.	Ant.	Siph.	Cau.	A.j.r.	2.h.t.
Mean . . .	1·708	0·556	0·220	0·137	0·142	0·095
S.D. . . .	0·144	0·019	0·017	0·006	0·003	0·002
s.e. ($\bar{x}$) . .	·0720	·0095	·0084	·0029	·0017	·0009

Type material: holotype and 3 paratypes. SURREY: West Byfleet, from roots of *Rumex acetosella*, in nest of *Lasius flavus*, 5.ix.48 (*H. L. G. Stroyan*);

in the author's collection. Further material from West Byfleet, 11–17.ix.50 (*H. L. G. Stroyan*), and from Bennekom, Holland, 15–27.ix.50 (*D. Hille Ris Lambers*).

Alate viviparous female (*from* 2 *specimens*): Characters very largely as for apterous viviparous female. *Head* broad, ocelli large and prominent. *Antennae* short, 6-jointed, joint III distinctly longer than processus terminalis, with 3–5 circular rhinaria over distal three-fourths, the rhinaria thick-bordered and with a small plaque. *Abdomen* with

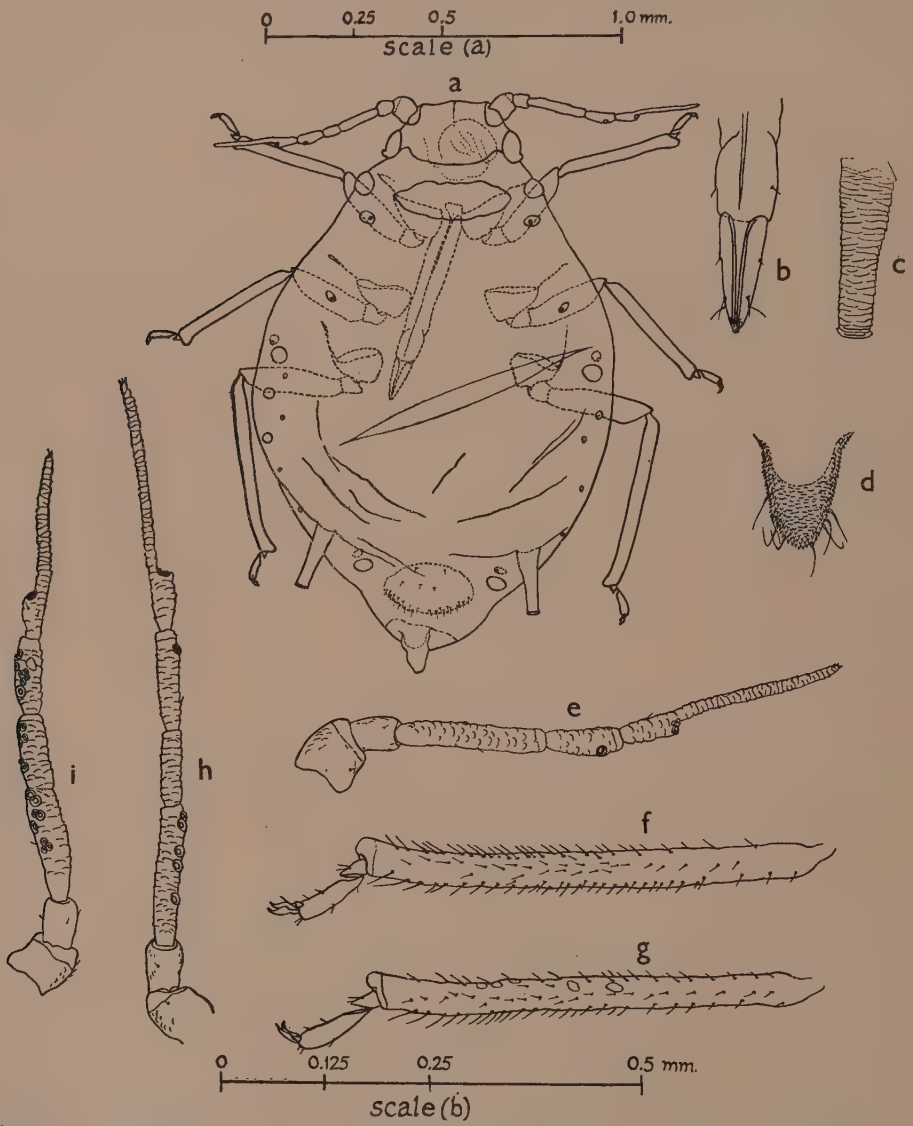

Fig. 2.—*Aphis etiolata* sp. n. (*a*) to (*f*) *apt.viv.* ♀. (*a*) Holotype (projector drawing from cleared specimen). (*b*) Apical rostral joint, further enlarged. (*c*) Siphunculus. (*d*) Cauda. (*e*) Antenna. (*f*) Hind tibia. (*g*) Hind tibia of *oviparous* ♀. (*h*) Antenna of *al.viv.* ♀. (*i*) Antenna of ♂. Figs. (*c*) to (*i*), scale as for (*b*).

marginal sclerites on segments 2–4 inclusive, but no other sclerotic pattern. *Marginal tubercles* as in apterae. Other characters, apart from presence of wings and sclerotic pterothorax, as in apterae. In one specimen the wings are crippled, in the other the fore wing of one side has the median vein once forked, that of the other side twice forked.

For biometric data see Table IIb.

TABLE IIb.—*Measurements of al.viv.* ♀, Aphis etiolata *sp. n.*

Body.	Ant.	Joint ratios (III–VI).	Siph.	Cau.	C.hrs.	A.j.r.	2.h.t.	Rhin./III.
1·46	0·69	11:5½:7½:5+14	0·18	0·10	11	0·13	0·10	5 & 4
1·60	0·69	11:6:8:5+13	0·18	0·11	12	0·14	0·09	4 & 3

Type material: Morphotype specimen from HOLLAND: Bennekom, from *Rumex acetosella*, 27.ix.50 (*D. Hille Ris Lambers*); in Dr. Hille Ris Lambers' collection.

Male (*from* 1 *specimen*): Apterous. *Head* and a band across pronotum sclerotic, dusky pigmented; otherwise without pattern. Ocelli absent. *Antennae* 6-jointed, but joints III and IV showing incipient fusion. Joint III with 8 and 10 rhinaria, IV with 8 and 7, V with 6 and 7 in addition to the small, deeply sunken primary; rhinaria of same type as in alate viviparous female, but with often an even thicker border and smaller plaque. Processus terminalis about 2·6 times basal part of VI. *Marginal tubercles* as in viviparous forms; small ones present on abd. 2 and 3 in addition to the large pairs on pronotum, abd. 1 and abd. 7. *Siphunculi* smaller than in other forms, subcylindrical, dark sclerotic, a little more than 1·1 times cauda in length. *Cauda* small, normal in shape, dusky sclerotic, with apparently about 6 hairs (too obscure for an accurate count). *Genitalia* normal. Other characters as in viviparae. Measurements of allotype (Wageningen, 15.x.50 (*D. Hille Ris Lambers*), in coll. D. H. R. L.): Body 1·40 mm., antenna (without joints I and II) 0·55 mm., joint ratios 9:5:6:4+10½/9:5½:6:4+10, siphunculus 0·10 mm., cauda 0·09 mm., caudal hairs 6 ?, apical joint of rostrum 0·12 mm., 2nd joint of hind tarsus 0·09 mm.

Oviparous female: Characters very much as for apterous viviparous female. Posterior end of *abdomen* rather produced. *Subgenital plate* typically divided medially as in other species of *Aphis*; but this character is very variable, and oviparae developing earlier, in September, often have the subgenital plate entire, or with only slight weakening medially. *Hind tibiae* not at all swollen, with sensoria ranging from 0–24, scattered along most of the apical half to two-thirds, irregular in shape and very hard to see. Frequently the number of sensoria varies appreciably between the two hind tibiae of one specimen, and the number does not seem to be at all closely correlated with the divided or undivided condition of the subgenital plate. At the same time, specimens with no sensoria on the tibiae and an entire subgenital plate are practically indistinguishable from viviparae unless the body cavity contains ova. *Caudal hairs* from 8 to 15 in number. Otherwise as for aptera.

For biometric data see Table IIc.

Type material: Morphotype, HOLLAND: Bennekom, 8.x.50 (*D. Hille Ris Lambers*); in coll. D. H. R. L. Other material from Surrey: West Byfleet, 11–17.ix.50 (*H. L. G. Stroyan*), and Holland: Bennekom, 15.ix–8.x.50 (*D. Hille Ris Lambers*).

Biology.

Found only on the fine roots of *Rumex acetosella* in the galleries of various ants' nests on sandy soils. Found with *Lasius flavus* (*H. L. G. Stroyan*) and

with *L. alienus*, *L. niger*, *L. umbratus*, *Tetramorium caespitum* and *Myrmica* sp. (*D. Hille Ris Lambers*). The finding of an apterous male and oviparae on *Rumex acetosella* confirms the completeness of the life cycle on *Rumex*. According to Dr. Hille Ris Lambers (*in litt.*) the ova, which are orange when first laid, are deposited deep in the soil. Alatae seem to be very rare in this species. Dr. Hille Ris Lambers finds the species very widespread in Holland on suitable soils; the British records are as yet from only one locality, and with only one species of ant, and it is possible that subtle differences in ecological conditions restrict the range of the species in this country.

TABLE IIc.—*Measurements of ovip.* ♀, Aphis etiolata *sp. n.*

(No. 3 from West Byfleet, Surrey; remainder from Bennekom, Holland; no. 9 is the morphotype specimen.)

Body.	Ant.	Joint ratios (III–VI).	Siph.	Cau.	C.hrs.	A.j.r.	2.h.t.	Sens./h.tib.
1·87	0·55	(7½:4½):5½:5+12	0·20	0·12	15	0·15	0·10	7 & 10
1·90	0·58	8:4½:6:5+13	0·19	0·11	11	0·15	0·09	8 & 7
1·70	0·50	10:5½:4½+11	0·17	0·10	11	0·14	0·09	6 & 17
1·86	0·57	8:5:6:4½+11	0·19	0·13	12	0·14	0·10	12 & 12
1·74	0·56	7½:4½:6:5+12	0·18	0·13	10	0·14	0·10	18 & 18
2·21	0·57	8:5:6:5+11½	0·20	0·14	9	0·14	0·10	24 & 19
1·78	0·53	7½:4:5½:4½+11½	0·14	0·12	9	0·14	0·09	3 & 2
2·05	0·51	(7½:4):5½:4+11	0·18	0·11	8	0·14	0·09	0 & 0
1·90	0·51	(6½:4½):5½:4½+11	0·17	0·11	10	0·14	0·10	7 & 4
2·05	0·53	(7½:4):6:4½+11	0·17	0·12	9	0·14	0·09	12 & 8

Systematic Position.

Dr. Hille Ris Lambers has suggested to the writer that the closest affinities of *Aphis etiolata* are with the root forms of *Aphis sambuci* L. However, the wide morphological divergences from even those forms of *sambuci* most nearly resembling *etiolata* are such as to suggest that the latter is systematically isolated. Thus, all forms of *sambuci* (Jacob, 1949) are much more extensively and heavily pigmented than *etiolata*, having at least sclerotic bars on abd. 7 and 8 in apterae, together with blackish legs and antennae. The antennae in all apterae of *sambuci* are also more than half as long as the body, while in *etiolata* they are at most little more than one-third as long. The rhinarial numbers in males and alatae of *etiolata* are very small, while in *sambuci* they are much greater; and the hairs on the antennae are shorter in proportion to the articular diameter of the third joint in *etiolata* than in even the shortest-haired forms of *sambuci*.

A second species of *Aphis* occurring on *Rumex acetosella* is *Aphis acetosae* F., which is common in similar localities to those frequented by *etiolata*. It is readily distinguished from *etiolata* by its dark blackish-green colour when alive and by the strongly developed pattern of black sclerotic bars on the dorsum in apterae. It lives either at or just below ground level under soil protection erected by ants, and is not truly subterranean like *A. etiolata*.

Nomenclature.

The name *etiolata*, while of barbaric derivation (a more correct latinised form would be *stipulata*), draws attention to the pale, etiolated-looking colour and lack of pigmented sclerotisation in the forms of the species.

3. **Aphis commensalis** sp. n.

Colour Notes.

Dark grey-green to blackish-green in life, heavily clothed with mealy greyish wax powder; sclerotic parts blackish.

Microscopic Morphology.

Apterous viviparous female: *Body* small, oval, of typical *Aphis* shape, 1·30–1·68 mm. long. *Head, antennae, legs* and *siphunculi* dusky sclerotic. *Frons* slightly sinuate before mounting, often losing the appearance of sinuation after mounting. Two pairs of frontal hairs, which are very long, fine and acute, the inner pair about equal in length to the distance between their bases, or up to 3½ times as long as the articular diameter of the third antennal joint. In addition there are one pair of hairs ventrally on frons, one pair on vertex between antennal bases and two pairs on vertex between the eyes, the members of each pair of the latter being rather close together. All these are very long and acute like the frontal hairs. *Antennae* moderately short, slender, 5-jointed in all material collected so far, though this may be seasonal; with normal imbrication; 0·45–0·70 mm. long; processus terminalis 1·6 to 2·2 times as long as basal part of joint V. *Antennal hairs* long and acute, those on III up to 1·4 times the articular diameter of joint. *Rostrum* short, reaching barely past middle coxae, apical joint blunt, rather straight-sided, with one pair of long, acute hairs at about one-third in addition to the three apical pairs. *Body* without sclerotic pattern apart from weak traces of a transverse band on pronotum and a pale narrow band across the eighth abdominal tergite. *Dorsal cuticle* colourless and featureless, *ventral cuticle* with a faint and hardly visible pattern of transverse rows of very minute spinules. All *dorsal, pleural* and *marginal* body hairs very long, fine and acute, much longer than ventral hairs, which are only moderately long and acute; the spinal hairs are in most instances considerably more than half as long as the cauda! The pleural hairs of the anterior abdominal segments are rather far separated from the spinal hairs and approximated to the marginal hairs; there are typically only 6 dorsal hairs per segment, one pair each of spinal, pleural and marginal hairs; and this, combined with their great length, gives the chaetotaxy a very distinctive appearance. *Marginal tubercles* present only on pronotum, abd. 1 and abd. 7, rather small, bluntly rounded, those on abd. 7 only about half the apical diameter of the siphunculi. *Siphunculi* short, stout, 0·07–0·13 mm. long, rather faintly spinulosely imbricate, with hardly any flange at apex, slightly tapering, nearly as thick as cauda and subequal or slightly greater in length. *Cauda* short, blunt, 0·07–0·12 mm. long, typically with 2 pairs of hairs near apex, occasionally with 5. *Legs* with tibial hairs long, fine and acute, outer ones equal to (anterior legs) or longer than (posterior legs) tibial diameter. Chaetotaxy of first tarsal joints 3.3.2. Rudimentary gonapophyses 3.

For biometric data see Table IIIa.

Type material: Holotype and 11 paratypes. Cambs.: Great Wilbraham, from galls of *Trichopsylla walkeri* (Förster) on leaves of *Rhamnus catharticus*, 7.ix.51 (*P. M. Naylor*); in the author's collection. Other material collected at Great Wilbraham, 17.viii.51 and 3.x.51 (from culture).

Male: Apterous, very small, of normal shape; 0·85–0·94 mm. long. *Chaetotaxy* as for apterous viviparous female, but hairs generally a little shorter. *Head*, traces of spinal bars on *pro-* and *mesonotum* and a small bar on abd. 8 dusky sclerotic, tibiae somewhat darkened apically. *Antennae*, effectively 5-jointed, but usually with some indication of a subdivision (which is never a functional articulation) of joint III to form joints III and IV of a normal 6-jointed antenna; smallish circular secondary rhinaria scattered along whole length of ant. III–IV (III–V). *Ocelli* absent. *Marginal tubercles* as in apterous

viviparous female. *Rostrum* proportionally a little longer than in aptera, reaching about to third coxae. Other characters as in aptera.

For biometric data see Table IIIb.

TABLE IIIa.—*Measurements and statistics of type series and additional apt.viv.* ♀ Aphis commensalis *sp. n.*

(The second figure in the Hair maxima/Ant. III column represents the articular diameter of the joint; all lengths in mm. except where otherwise stated; antennae measured without joints I and II.)

Specimen.	Body.	Ant.	Joint ratios (III–V).	Siph.	Cau.	C.hrs.	A.j.r.	2.h.t.	Hair maxima: Ant. III.	Hair maxima: Spinal.
Holotype	1·656	0·664	16:7½:6+12 16:7:6+12½	0·129	0·107	4	0·104	0·096	27μ/18μ	64μ
Paratype	1·408	0·640	13½:8:5½+13 14:7½:6+12	0·107	0·100	4	0·100	0·089	32μ/18μ	61μ
,,	1·152	0·448	9½:5:4½+9 9:4½:5+8	0·075	0·071	4	0·089	0·075	18μ/16μ	54μ
,,	1·600	0·664	(10½:6):7:6½+11½ 16½:7:6½+11½	0·118	0·118	4	0·104	0·093	34μ/16μ	61μ
,,	1·488	0·672	16½:7½:6½+11½ 14½:8:5½+12	0·114	0·096	4	0·104	0·089	29μ/16μ	57μ
,,	1·304	0·640	15:7:6+12 15:7½:6+11½	0·107	0·093	4	0·100	0·089	34μ/14μ	61μ
,,	1·536	0·688	16:8:6+13 16:8:6+13	0·118	0·107	4	0·104	0·089	32μ/16μ	57μ
,,	1·576	0·624	14½:7:5½+12 14½:7:6+12	0·107	0·107	4	0·100	0·089	30μ/16μ	57μ
,,	1·536	0·584	13:7:5½+11 13½:7:6+12	0·107	0·104	4	0·100	0·089	25μ/16μ	61μ
,,	1·552	0·696	16½:8:6+13 16:8:7+13	0·114	0·096	4	0·100	0·096	31μ/16μ	64μ
,,	1·536	0·616	15:7:5½+11 15½:6½:5½+11	0·114	0·104	4	0·096	0·093	32μ/15μ	61μ
,,	1·360	0·584	13:6:5½+12 13:6:5½+12	0·104	0·100	5	0·096	0·093	30μ/14μ	57μ
13	1·41	0·50	11:5½:5+10 11:5½:5+10	0·10	0·10	4	0·10	0·09	21μ/14μ	54μ
14	1·47	0·61	13½:7:5½+12 14:7½:5½+12	0·11	0·10	4	0·10	0·09	29μ/16μ	64μ
15	1·68	0·62	14:7:5½+12½/ ?	0·10	0·10	4	0·10	0·09	32μ/15μ	61μ
16	1·42	0·60	13:7½:5½+11½ 13:7:5½+12	0·11	0·10	4	0·10	0·09	27μ/14μ	61μ
17	1·60	0·60	14:7:5½+11 14:7:5½+12	0·11	0·10	5	0·11	0·09	30μ/17μ	64μ

Statistics of type series of *Aphis commensalis* sp. n.

	Body.	Ant.	Siph.	Cau.	A.j.r.	2.h.t.	Hair maxima: Ant. III.	Hair maxima: Spinal.
Mean .	1·475	0·627	0·110	0·100	0·100	0·090	60μ	30μ
S.D. .	0·1422	0·0671	0·0129	0·0114	0·0044	0·0055	3·15μ	4·51μ
s.e. ($\bar{x}$) .	·0411	·0194	·0037	·0033	·0013	·0016	0·91μ	1·30μ

Type material: Allotype from Cambs.: Great Wilbraham, 3.x.51 (*P. M. Naylor*); in the author's collection.

Oviparous female: Smaller than viviparous female, rather narrow and elongate in life, 1·19–1·34 mm. long. Characters in general as for apterous viviparous female, but *siphunculi* and *cauda* rather shorter, and *subgenital plate* divided medially. *Hind tibiae*

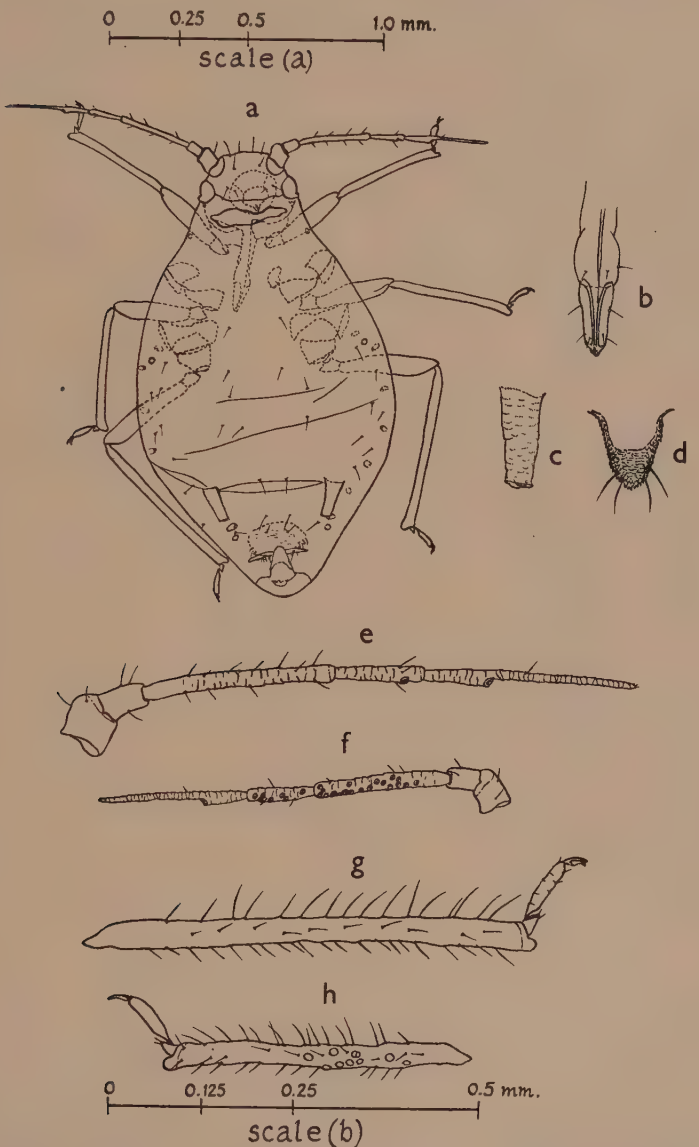

Fig. 3.—*Aphis commensalis* sp. n. (*a*) to (*e*) *apt.viv.* ♀. (*a*) Holotype (projector drawing from cleared specimen). (*b*) Apical rostral joint, further enlarged. (*c*) Siphunculus. (*d*) Cauda. (*e*) Antenna of holotype. (*f*) Antenna of ♂. (*g*) Hind tibia of holotype. (*h*) Hind tibia of oviparous ♀. Figs. (*c*) to (*h*), scale as for (*b*).

hardly or very slightly thickened on basal half, with somewhat raised, regularly rounded or oval sensoria distributed irregularly from base to a little beyond half the length, from 10 to 25 in number. Rudimentary gonapophyses 3.

For biometric data see Table IIIc.

TABLE IIIB.—*Measurements of* ♂ Aphis commensalis *sp. n.*

(All lengths in mm.; antennae measured without joints I and II.)

Body.	Ant.	Joint ratios (III–V(VI)).	Siph.	Cau.	C.hrs.	A.j.r.	2.h.t.	Rhin./L.	Rhin./R.
0·93	0·50	12:5½:5+8½	0·07	0·06	4	0·08	0·08	24/4	23/6
0·88	0·46	11½:5½:4+8	0·06	0·06	4	0·08	0·07	27/6	26/8
0·94	0·49	12½:5½:4+8½	0·07	0·06	4	0·08	0·08	21/6	26/7
0·94	0·53	(8:6):6:4½+8½	0·07	0·06	4	0·09	0·08	(17/12)/6	(14/12)/6
0·90	0·50	12½:6:4½+8½	0·07	0·06	4	0·08	0·08	29/6	27/6
0·90	0·46	12:5:4+7½	0·07	0·06	4 ?	0·08	0·07	21/4	23/6
0·85	0·47	(7:5):5:4+8½	0·07	0·06	4	0·08	0·08	(14/10)/8	(13/11)/4
0·88	0·49	12:5½:4+9	0·06	0·06	4	0·09	0·07	25/7	26/7
0·94	0·50	12:5½:4+9½	0·07	0·06	4	0·08	0·08	24/6	26/5
? (shrunk)	0·47	11:5½:4+9 ?	0·07	0·06	4	0·08	0·07	26/3	26/4

TABLE IIIC.—*Measurements of ovip.* ♀, Aphis commensalis *sp. n.*

Body.	Ant.	Joint ratios (III–V).	Siph.	Cau.	C.hrs.	A.j.r.	2.h.t.	Sens./h.tib.
1·26	0·54	11½:6½:5+10½	0·07	0·06	4	0·09	0·08	11 & 21
1·31	0·50	10½:5½:4½+10½	0·07	0·07	4	0·09	0·08	11 & 14
1·23	0·46	9½:5:5+9½	0·07	0·07	4	0·09	0·08	20 & 13
1·26	0·50	11:5½:5+10	0·07	0·06	5	0·09	0·08	25 & 21
1·22	0·45	9:5:4½+9½	0·07	0·06	4	0·09	0·07	18 & 14
1·30	0·44	9:5:4½+9	0·08	0·07	5	0·09	0·08	23 & 19
1·31	0·49	10:5½:5+10	0·07	0·07	4	0·09	0·08	17 & 17
1·30	0·51	11:6:5+10	0·07	0·06	4	0·09	0·08	12 & 14
1·26	0·45	9:5:4½+9½	0·07	0·06	4	0·09	0·08	10 & 12
1·25	0·49	10:5½:5+10	0·07	0·06	4	0·09	0·08	18 & 14
1·34	0·52	10½:6:5+11	0·07	0·07	4	0·09	0·08	12 & 22
1·33	0·50	10:6:5+10	0·07	0·07	5	0·09	0·08	19 & 20
1·19	0·50	10:6:4½+10	0·08	0·07	4	0·09	0·08	— & 14

Type material: Morphotype from Great Wilbraham, 3.x.51 (*P. M. Naylor*); in the author's collection.

Biology.

All the material of this species collected so far was found by Mr. P. M. Naylor living within the otherwise deserted leaf-edge pocket-galls of the Psyllid *Trichopsylla walkeri* (Förster) on the leaves of *Rhamnus catharticus*. A wide search of *Rhamnus* in the Cambridge area yielded only a very small number of localities where the gall was present, and of these only two spots within a quarter mile of each other in Great Wilbraham yielded the aphids. Sexual forms were mature in the galls on 3rd October, and two or three shiny yellowish ova were found inside the galls. The proportions of the sexes present on this date were much more nearly equal than in most samples of sexuales of *Aphis*, a total of 10 males to 13 mature oviparae being collected. This may

be correlated with the peculiar and restricted habitat of the species, since apparently copulation and oviposition both take place within the limits of the gall in which the aphids develop, and it is hard to envisage the males successfully migrating from one gall to another. The heavy coating of wax powder on the aphids is in accordance with the condition generally found among aphids inhabiting very small and restricted galls. No alatae have been found as yet, and it is impossible to say whether all the sexuparae are apterous. The cycle must be completed on *Rhamnus*, as is evidenced by the apterous males, but whether the earlier spring and summer generations are free-living or similarly dependent on *Trichopsylla* is not known.

Systematic Position.

Aphis commensalis is the third species of *Aphis* known from *Rhamnus catharticus* (and possibly the fourth, if *Aphis versicolor* (Börner) is not, as appears possible, a synonym of *A. mammulata* Gimingham and Hille Ris Lambers). *Aphis nasturtii* Kalt.[1] (*rhamni* Koch *nec* B. de F.) is the common heteroecious species living in spring on the shoot apices and migrating to herbaceous secondary hosts including potato, *Rumex* and many others. The males are alate and marginal tubercles are present only on pronotum and abd. 1 and 7. Gimingham and Lambers (1949) described *Aphis mammulata* from sexuparae and sexuales found on *Rhamnus* in Oxfordshire; the males are apterous, and all forms described have very large mammular tubercles on the margins of abd. 1–4 inclusive and on pronotum and abd. 7. The colour is described as greenish grey with young forms reddish brown. Börner (1950) described *Aphis versicolor* (*Doralina versicolor*) as having large marginal tubercles on abd. 1–5 and 7, and gives the colour as dark green, with the males having the abdomen fox red. The length of processus terminalis given by Gimingham and Lambers for *mammulata* falls well in the middle of the range given by Börner for *versicolor*. If it is possible that the reddish-brown young forms mentioned for *Aphis mammulata* were in fact the smaller males, there appears to be a strong likelihood that *versicolor* Börner is a synonym of *mammulata* Gimingham and Lambers. *Aphis commensalis* may immediately be distinguished from *mammulata* and *versicolor* by the absence of the large marginal tubercles on abd. 2–4 (5) inclusive; from *mammulata* by the extremely long spinal, pleural and marginal hairs of the body and the much shorter siphunculi and 5-jointed antennae in the autumn apterae, as well as the smaller number of caudal hairs (4–5 against 8–13); and from *nasturtii* by the apterous males, smaller size, heavy wax coating, 5-jointed antennae in autumn forms and peculiar biology, as well as by the very long hairs.

Acknowledgments.

The author is indebted to Dr. D. Hille Ris Lambers for indicating the existence of the description of *Sappaphis aizenbergi* (Shaposhnikov); and for discussion of the systematic position of *Aphis etiolata* sp. n., and the loan of

[1] *Aphis transiens* was described by Walker from *Polygonum*; Börner uses the name to replace *rhamni* auctt. *nec.* B. de F. *A. nasturtii*, however, antedates *transiens* by 6 years.

Dutch material for description and figuring. He is also indebted to Mr. P. M. Naylor for his assiduous work in collecting the type material of *Aphis commensalis* sp. n., credit for the discovery of which must go to Mr. Naylor.

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Book Notice

The Origin and History of the British Fauna. By B. P. Beirne. 8vo. London (Methuen), 1952. Pp. 164, text illust. Price 18*s.*

This work is an attempt to explain the present composition and distribution of the fauna of the British Isles by reconstructing how the animals arrived and their subsequent development to the present day. Throughout special emphasis is laid on the mammals, birds, butterflies and moths.

The first chapter deals with the British Isles and their present climate and fauna, and there follow eight chapters on Modes of Immigration ; Methods of Reconstructing the Histories ; The Ice Age and its Effects on the Fauna ; Glacial-Phase Survivors ; The Celtic Land Survivors ; The Cambrian, Channel and Dogger Land Survivors ; Post-glacial Faunal Changes, and The Development of the British Fauna.

There are 60 distribution maps, and a bibliography and index complete the work.

WYEOMIA (*WYEOMYIA*) *APHOBEMA* VAR. *AEQUATORIALIS* VAR. N., A NEW SABETHINE MOSQUITO FROM ECUADOR (DIPTERA: CULICIDAE).

By Dr. Roberto Levi-Castillo.

(*Director of the Ecuadorian Centre for Entomological Research, Guayaquil, Ecuador.*)

The new variety described in this paper was taken for the first time near Tena, province of Napo-Pastaza, Ecuador, during a local survey to obtain mosquitoes for an epidemiological study of the regional vectors of jungle yellow fever.

The specimens were captured by means of a chloroform bottle while resting on a tree near a clearing in the virgin tropical jungle.

No larvae or pupae were obtained from the type locality.

Wyeomyia (*Wyeomyia*) *aphobema* var. **aequatorialis** var. n.

Female.—Proboscis long and slender, shorter than the anterior femur, black with a metallic reflection. Occiput covered with dark blue scales with a metallic reflection. A row of erect scales posteriorly. Vertex with dark blue scales with a metallic blue reflection. Eyes lined with silvery-white scales and sparse dark setae at margins. Clypeus with a patch of long dark overhanging setae.

Pronotal lobes with dark blue scales with metallic violet reflections and long sparse dark setae. Mesonotum with dark blue scales with metallic violet reflections, with very small, dark sparse setae on the disc, with some coppery coloured scales having a metallic reflection. Scutellum covered with scales of the same colour as those on the mesonotum, with dark setae on the lobes. Pleurae and coxae with silver scales and sparse dark blue scales.

Legs black with a metallic reflection and white spots on interior basal portion of femora and tibiae. Tarsi dark brown, with basal and apical white spots. Fourth tarsal segment of posterior legs with wide white basal and apical bands, the middle dark; fifth tarsal segment all white. Wings with ovate dark scales. Abdomen dark blue with metallic violet reflections, darker than mesonotum, with a few silvery white scales basally on dorsum of segments. Venter with silvery-white scales and a few dark ones, especially on the last sternites.

Male.—Coloration as in female, antennae very plumose with a few stout setae and with dark scales on eighth abdominal tergite. *Male terminalia:* Coxite (fig. 1) pyramidal, the outer surface covered with short, stout setae and small striate scales; inner lobe on inner surface with eight stout sharp rods arising from a chitinised base; a horseshoe-like chitinised area with numerous very short slender setae below and to one side of inner lobe; at each end of this area is a very thick seta, slightly curved and spine-like; the surface below being covered with slender setae, smaller than those on the horseshoe-like coxite, heavily sclerotised, below which is the chitinised ring of the ninth tergite. Clasper stout, slightly curved in the middle, thickened subapically, with three stout long setae and a small chitinised nail-like apical spine. Mesosome (fig. 2) with two hammer-like apical appendages with lateral processes having long, chitinised teeth; a well chitinised basal body, arising from two triangular, chitinised basal areas. Ninth tergite (fig. 3) with six broad striated setae on each side, the three external long, sabre-like, the three internal shorter, straight, acutely pointed, the series continuous and all arising from chitinous tubercles. Tenth sternite (fig. 4) pyramidal, heavily chitinised, with about five teeth arising at different levels near the apex, which is rounded.

Larva: Unknown.

Pupa: Unknown.

Holotype, ♀: Ecuador: Tena, Napo-Pastaza Province.
Paratypes: 2 ♂.

The specimens are deposited in the collection of the Ecuadorian Centre for Entomological Research; male terminalia mounted on slides, in the same collection.

Figs. 1–4.—*Wyeomyia (Wyeomyia) aphobema* var. *aequatorialis* var. n. (1) Coxite and clasper. (2) Mesosome. (3) Ninth tergite. (4) Tenth sternite.

The male terminalia shows the most interesting variation in the mesosome. In *Wyeomyia (Wyeomyia) aphobema* Dyar, this organ is an oval with a small horn-like prominence subapically forming, to each side, a rounded arc (Lane and Cerqueira, 1942 : 717, fig. 85), while in the new variety this is replaced by a set of three prominences, of which the largest is situated at the external apical angle of the mesosome (fig. 2). Another interesting and constant distinction is observed in the teeth of the ninth tergite, in which in the typical species each

lobe has four to five setae (three long and two smaller ones), whereas in the Ecuadorian variety each lobe has three sabre-like long setae and three smaller ones (fig. 3), but wider and more heavily chitinised than in the typical form (Lane and Cerqueira, 1942 : 717, fig. 84).

Acknowledgments.

I am grateful to Mr. Walter Vivar, who made the camera lucida drawings of the type slides, and to Dr. John Lane, of Sao Paulo University, and Dr. Alan Stone, of the U.S. National Museum, for their very kind help and advice in preparing this paper.

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A NOTE ON *STENALEYRODES VINSONI* TAKAHASHI (HEMIPTERA : ALEYRODIDAE).

By Raymond Mamet.

(*Department of Agriculture, Mauritius.*)

Numerous specimens of *Stenaleyrodes vinsoni* Takahashi collected on leaflets of various palm trees in Saint Denis (Réunion Island) were kindly given to me by Mr. J. R. Williams, who reported that the species was a fairly troublesome pest of these plants. The palms affected by it were *Chrysalidocarpus lutescens*, *Cocos nucifera* and *Oreodoxa regia*.

I take this opportunity to supplement the original description of this species published a few years ago (1938, *Trans. nat. Hist. Soc. Formosa*, **28** : 269–271, 5 figs.) by my friend, Dr. Ryoichi Takahashi, to whom I forwarded, at that time, a few specimens collected in the same locality on an unidentified palm tree.

Pupa case : Pale brown, shiny, not covered with wax ; with numerous fairly long, fine, fluffy, bluish-white waxy secretions arising from the margin. Dorsum with fairly numerous, circular, clear pores in a rather narrow submarginal band. Cephalothorax with 7 groups of submarginal papillae : one group occurring in the frontal area and the others (3 pairs) laterally ; the frontal group composed of 0–3 papillae and each lateral group of 3–5 papillae. Abdomen with 1–2 pairs of groups of similar submarginal papillae ; first pair, which is invariably present and occurring near the suture between the thorax and abdomen, with 2–6 papillae ; second pair which, when present, occurs near the suture between the third and fourth abdominal segments, with 0–6 papillae. I have been unable to find the third group of papillae mentioned by Takahashi in his description, and figured by him as occurring on one side of the fifth abdominal segment submarginally in the illustration (fig. 1) accompanying the description.

The above additional description was made on 17 mounted individuals and numerous unmounted specimens collected on leaflets of *Chrysalidocarpus lutescens*, *Cocos nucifera* and *Oreodoxa regia* (Palmae) in Saint Denis (Réunion Island) on 19–21.vii.1951 (Nos. RHe 26, 58, 59 and 70) (*J. R. Williams*).

TWO NEW GENERA OF THE SUBFAMILY ACRIDINAE (ORTHOPTERA, ACRIDIDAE).

By V. M. Dirsh, D.Sc., F.R.E.S.

Chromacrida gen. n.

This genus belongs to the tribe Acridini of the subfamily Acridinae, characterised by the absence of the femoral stridulatory pegs, (*see* Dirsh 1950, Revision of the group *Truxales*, *Eos*, *Tomo extraordinario*) and, on the basis of its general habitus, to the *Acrida* group. From the latter genus *Chromacrida* differs strongly by the absence of the wing speculum and brightly coloured apical half of wing.

Body strongly elongate, ratio of length to maximal width 10·1–12·2. Antenna strongly elongate, flattened and gradually tapering to the apex; its lateral margins in basal fourth slightly serrated. Head strongly elongate, conical; fastigium of vertex large, spatulate, strongly projecting in front of the eyes. Pronotum long; in prozona, single transverse sulcus is slightly beyond the middle; median and lateral carinae low but distinct; mesosternal interspace elongate, with concave lateral margins and broadened apex. Elytron long and narrow; ratio of length to width 12–13·6, with strongly acute apex. Wing rather shorter than elytron, without speculum, brightly coloured in the apical and external region. Hind femur long and narrow, ratio of length to width 18–19. Hind knee with equally short upper lateral lobes on both sides and with a small median lobe. Arolium large, as long as a claw. Male supra-anal plate triangular, simple. Cercus short, narrow conical. Subgenital plate short, conical with acute apex. Supra-anal plate of female obtusangulate; subgenital plate broadly rounded at the apex. Ovipositor short, robust, with broad, slightly curved valves.

Type species: *Acrida radamae* Saussure, 1899.
Occurs in Madagascar only.

Chromacrida radamae (Saussure).

1899, *Acrida radamae* (♀ only) Saussure, *Abh. Senckenb. naturf. Ges.* **21** : 629.

I have examined a series of specimens from the Geneva Museum, on which Saussure appears to have based his descriptions of *Acrida radamae* and *A. sanguinea*. Only one female from this series agrees with the description of the female of *Acrida radamae* Saussure and it is labelled: "Madagascar, ♀, H. de Saussure" and "Brunneriana Bol. Madagascar," the last label being probably of later origin. This female I designate as the type of *Acrida radamae* Saussure. The male described by Saussure as the male of *A. radamae* does not belong to this species, but to *Acrida sanguinea* Saussure (*see below*).

♀ (Type, redescription). Body slender. Head strongly elongate; frons in profile strongly concave; antenna longer than head and pronotum together, narrow, gradually narrowing to the apex; fastigium of vertex with parallel sides and broadly rounded apex. Pronotum slightly saddle-shaped; lateral carinae in prozona straight and divergent, in metazona, divergent and curved; apex of metazona acutangulate and pointed. Elytron long and narrow, ratio of length to width 12·1, with acute apex. Wing slightly shorter

than elytron, broad, ratio of length to maximal width about 2·1. Hind femur well produced beyond the apex of the abdomen. General coloration dirty-yellowish; wing on the external margin blackish-brown, gradually turning to flame-red and with the remaining basal part creamy-yellowish.

♂. As the female, but smaller.

Length of body ♂ 44–45 mm., ♀ 60–71 mm.; pronotum ♂ 6·3 mm., ♀ 9·3–10·4 mm.: elytron ♂ 39·5–40 mm.; ♀ 56–61 mm.; hind femur ♂ 27–28 mm., ♀ 32·5–41 mm.

Chromacrida brunneriana (I. Bolivar).

1893, *Tryxalis brunneriana* I. Bolivar, *Feuill. jeun. Nat.* **23** : 161.
1899, *Acrida radamae* (♂ only), Saussure, *Abh. Senckenb. naturf. Ges.* **21** : 629.
1899, *Acrida sanguinea* ♀ Saussure, *Abh. Senckenb. naturf. Ges.* **21** : 629.
1902, *Acrida brunneriana* Burr, *Trans. ent. Soc. Lond.* **1902** : 158.
1902, *Acrida sanguinea* Burr, *Trans. ent. Soc. Lond.* **1902** : 159.
1902, *Acrida intercalata* Burr, *Trans. ent. Soc. Lond.* **1902** : 162.
1910, *Acrida sanguinea* Kirby, *Syn. Cat. Orth.* **3** : 91, no. 2.
1910, *Acrida brunneriana* Kirby, *Syn. Cat. Orth.* **3** : 91, no. 1.

I have received from the Madrid Museum one male with the following labels:

1. " Madagascar, Sitcora (sic !).
2. " Tryx. Brunneriana Sauss. in litt. Madagascar Centrale. Coloration des ailes ! ".
3. Holotipo.
4. Acrida brunneriana (Bol.). Det. E. Morales, 1951.

The last two labels are quite recent.

This specimen is undoubtedly the type of the original description of I. Bolivar of *Tryxalis brunneriana*.

I also examined four females from the Geneva Museum, labelled " *Acrida sanguinea* " and " Madagascar, Antananarivo," which agree with the original description of *A. sanguinea* Saussure based on a female; one of them I designate as the type of that species and it is conspecific with *Acrida brunneriana* I. Bolivar. The male described by Saussure as *A. radamae* also belongs to this species.

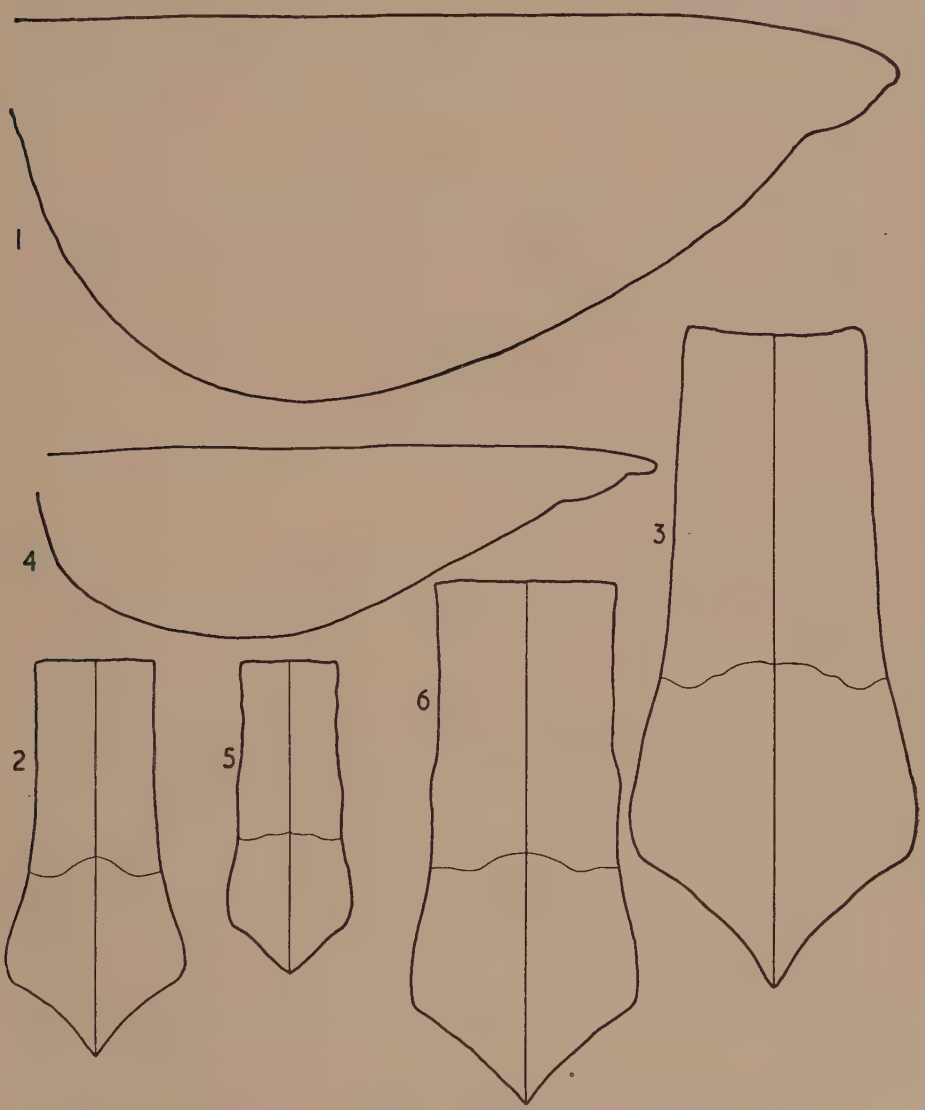
Acrida intercalata Burr appears to be a newly moulted specimen of *Chromacrida brunneriana* with milky-white wings which have not attained their full coloration.

♂ (Type, redescription). Body very slender. Head strongly elongate, frons in profile moderately concave; antenna longer than head and pronotum together, narrow, tapering to the apex, widening in the basal half; fastigium of vertex slightly broadened to the apex, which is rounded. Pronotum weakly tectiform, lateral carina in prozona undulate, parallel, in metazona slightly curved; apex of metazona acutangulate. Elytron long and very narrow, ratio of length to width 13·5, with pointed apex. Wing considerably shorter than elytron, narrow, ratio of length to maximal width about 3·1. Hind femur produced far beyond the apex of the abdomen. General coloration yellowish-brown. Wing on the external margin blackish-brown, disc of wing, its anterior part and apical lobe crimson red, gradually becoming pale to the base.

Length of body ♂ 32–33·5 mm., ♀ 47–53 mm.; pronotum ♂ 4·5–5 mm., ♀ 7–8 mm.; elytron ♂ 28–30 mm., ♀ 50–51 mm.; hind femur ♂ 19–21·5 mm., ♀ 30·5–33 mm.

Main difference between the two species:

Chromacrida radamae.	*Chromacrida brunneriana.*
Body larger and less slender.	Body smaller and slender.
Less sexual dimorphism.	More sexual dimorphism.
Frons, in profile, more concave.	Frons, in profile, less concave.
Carinae of pronotum, in prozona, straight and divergent.	Carinae of pronotum, in prozona, undulate and parallel.
Apex of metazona pointed.	Apex of metazona acute but not pointed.
Wing twice as long as wide.	Wing three times longer than its width.



FIGS. 1–3, *Ch. radamae:* 1, wing; 2, pronotal disc, male; 3, ditto, female.
FIGS. 4–6, *Ch. brunneriana:* 4 wing; 5, pronotal disc, male; 6, ditto, female.

Brachyacrida gen. n.

Body elongate, ratio of length to maximal width 6. Antenna flattened, moderately broadened at the base and gradually tapering to the apex. Head elongate, conical. Fastigium of vertex strongly projecting in front of the eyes. Pronotum saddle-shaped, with a single transverse sulcus; posterior angle very acute and pointed. Mesosternal interspace as broad as long. Metasternal interspace square in the male and broader than long in the female. Elytron long, ratio of length to width 7·5–8·2, produced well beyond the apex of the abdomen, with strongly obtuse, almost rounded apex. Wing broad, pellucid, slightly yellowish, with a narrow speculum. Hind femur long, ratio of length to maximal width 9–10 without stridulatory pegs. Hind knee with short acute lateral lobes and a small acute median one. Arolium moderately large, broad, half the length of the claw. Male subgenital plate conical with subacute apex. Cercus short, with rounded apex. Supra-anal plate simple, triangular. Female subgenital plate weakly trilobate at the apex. Supra-anal plate broadly triangular, simple. Ovipositor short, robust, with broad, slightly curved valves.

This genus is very similar in general appearance to *Truxalis* Fabr., but, because of the absence of stridulatory pegs of the hind femur, it should be referred to the tribe *Acridini* (*see* Dirsh, 1950, *Eos, Tomo extraordinario*) and the group *Acrida*. It is very close to the genus *Acrida* L. but differs strongly by the saddle-shaped pronotum, shortened head, rounded apex of the elytron, comparatively broad mesosternal interspace and comparatively broader hind femur.

Type species: *Brachyacrida distanti* sp. n.

Brachyacrida distanti sp. n.

1892, *Acrida turrita* Linné, var. *calaeata* Saussure (*nom. nudum*) *in:* W. L. Distant, *A Naturalist in the Transvaal*: 259. London.

This species was recorded by Distant under the name *Acrida turrita* L. var. *calaeata* Saussure but without any description, and Saussure has never described it. Therefore the name *calaeata* is a *nomen nudum*. I have studied Distant's specimens in the British Museum and found them to belong to a new genus.

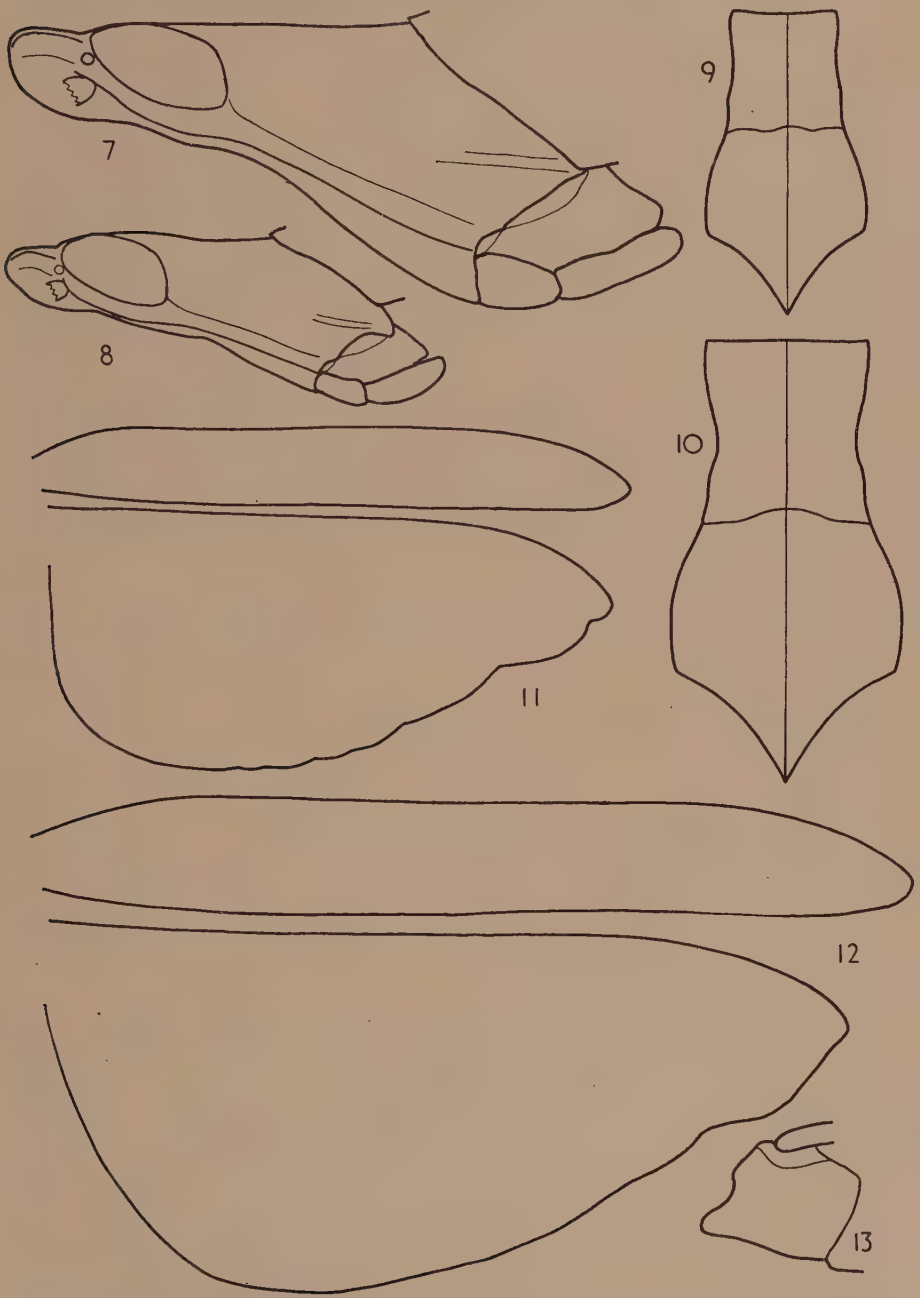
♂ (type): Of medium size for the group and relatively robust. Head short, strongly broadened in the basal part; frons, in profile, slightly incurved. Fastigium of vertex comparatively short, narrowing to the apex, which is rounded. Antenna almost as long as head and pronotum together. Lateral carinae of pronotum in prozona undulate, in metazona strongly curved; transverse sulcus before the middle of the pronotal disc; posterior margin of metazona strongly acutangulate and pointed. Elytron broad, weakly narrowing to the apex. Wing broad, with broadened apex, almost as long as elytron. Lateral lobes of the hind knee short, acute, almost of equal length on both sides; the lower lobe narrower and more acute than the upper one. Subgenital plate short, in profile broad, with short subacute apex; its upper margin expanded, but does not form a definite projection.

General coloration green; elytra with characteristic pattern formed by a row of brownish spots along the middle; wing slightly greenish-yellow.

♀ (paratype): As the male, but much larger; elytron with more rounded apex and with more distinct dark pattern.

Length of body ♂ 30 mm., ♀ 45·5–54 mm.; elytron ♂ 27·5 mm., ♀ 37–41·5 mm.; Hind femur ♂ 19·5 mm., ♀ 27·5–31 mm.; pronotum ♂ 5·5 mm., ♀ 9–9·5 mm.; frons ♂ 7·5 mm., ♀ 10·5–12 mm.

South Africa: Pretoria, 2 ♀ (*W. L. Distant*). Orange River Colony, 1903, 5 ♀ (*G. E. H. B. Hamilton*) Cape Province, Leeuwfontein, Luckhoft, March, 1929, 1 ♂ (type), 1 ♀ (*S. J. S. Marais*).



Figs. 7–13, *Brachyacrida distanti:* 7, head of female; 8, head of male; 9, pronotum of male; 10, pronotum of female; 11, elytron and wing of male; 12, elytron and wing of female; 13, subgenital plate of male.

TWO NEW ORSILLINI FROM KILIMANJARO (HEMIPTERA: LYGAEIDAE).

By Robert L. Usinger.
(*University of California, Berkeley.*)

At the generous suggestion of Dr. W. E. China I have been privileged to study a small collection of Orsillini collected by Dr. George Salt in the course of an ecological study of the fauna at high altitudes on Kilimanjaro, Tanganyika Territory. Members of the genus *Nysius* Dallas and its allies are well known from high altitudes, China (1934) having described *Nysius steeleae* from an elevation of 13,360 feet in moss at the rim of the crater on Mount Cameroon, and Hutchinson (1934) having described *Nysius aricae alticola* from 17,381 feet elevation, Ororotse Tso, Indian Tibet, near the margin of a lake among short, sparse grass. In the Hawaiian Islands *Nysius terrestris* Usinger (1942*a*) breeds on the remarkable silver-sword (*Argyroxiphium*) which is confined to the summits of Haleakala, Mauna Kea and other volcanic mountains between 10,000 and 13,000 feet. Doubtless many other species await discovery on remote, wind-swept peaks in various parts of the world.

One of the species collected by Dr. Salt has, of necessity, to be referred to a new genus. To facilitate the placing of this genus, a key which I prepared some years ago has been modified, and is offered here as a preliminary attempt at a world classification of the Orsillini. This key is unsatisfactory in many ways, since several of the included genera are polyphyletic. However, it does include all of the genera known to me, and perhaps will provide a basis for future studies.

Nysius salti sp. n.

Robust, predominantly dark with a fine, subappressed pubescence which is most conspicuous on clavus and corium.

Head about three-fourths as long as broad across eyes, 40:54; the eyes less than half as wide as interocular space, 12½:29; vertex feebly elevated, densely and evenly punctured; bucculae reaching seven-eighths of distance to base of head, distinctly elevated except posteriorly, where they terminate in a gradual curve. Rostrum reaching to hind coxae; the first segment not quite reaching to limits of bucculae; proportion of segments one to four as 27:26:23:16. Antennal proportions 16:33:27:35.

Pronotum about as long as head, less than twice as wide across humeri as long, 70:40; disc depressed at centre and sublaterally along hind margin; surface evenly, distinctly punctate, the punctures larger than those of vertex; less than one puncture width apart; with a distinct median longitudinal carina interrupted only by callosities, the carina marked simply by a glabrous area at hind margin.

Scutellum three-fourths as long as wide, 31:41, rugosely punctate laterally.

Hemielytra flaring beyond basal fourth. Widest a little in front of middle of costal margin. Membrane exceeding tip of abdomen by one-fifth of its length.

Colour largely black, the vertex mottled brown and clypeus with a median longitudinal pale stripe. Pronotum black with ochraceous areas at middle and sublaterally along anterior margin, on humeri and broadly along posterior margin and somewhat irregularly over

disc of hind lobe. Scutellum entirely black. Clavus and corium pale with brown markings as illustrated. Membrane infuscated between the white veins. Under surface black except for the usual pale areas on edges of bucculae, acetabula, etc. Antennae yellowish-brown with irregular black marks on first segment. Femora black with yellowish-brown apices. Tibiae and tarsi yellowish-brown except for infuscate apical tarsal segments.

Size: Length 3·9 mm.; width (pronotum) 1·2 mm., (hemielytra) 1·4 mm.

Holotype, ♂, No. 90, TANGANYIKA TERRITORY: Kilimanjaro, Shira Plateau, Camp 2, 12,450 ft., 29.xi.1948, *ex* moss (*G. Salt*). Allotype, ♀, No. 514, same data as type but with notation "sweeping *Helichrysum newii* and *hoehnelii*." Paratypes, 2 ♂, Nos. 513 and 515, same data as allotype. Two nymphs, Nos. 91 and 92, *ex* moss, can be identified with certainty as belonging here. The allotype differs as might be expected in that the femora are spotted. In one of the male paratypes the bucculae reach almost to the base of the head, doubtless due to the fact that the head is bent downward slightly out of position. Types and nymphs deposited in the British Museum (Nat. Hist.); one paratype retained in the collection of the author.

The chief distinguishing characters of *Nysius salti* are bucculae well elevated, not reaching base of head; first rostral segment slightly shorter than bucculae; rostrum reaching to hind coxae, head finely punctate, pronotum more coarsely punctate, pronotal disc with longitudinal carina; scutellum entirely black: costal margins moderately flaring, widest slightly in front of middle; membrane infuscate between white veins; and antennae and legs distinctly coloured.

N. salti is perhaps most closely related to *N. steeleae* China, which differs in its smaller size, longer rostrum, more uniformly brownish clavus and inner corium and white membrane.

Oreonysius gen. n.

Body strongly convex above, the punctures of head, pronotum and scutellum coarse, the pubescence fine and subappressed.

Hemielytra almost entirely coriaceous, strongly convex and dilated, the costal margin narrowly reflexed and marked by faint punctures, the claval suture closely punctured as seen from the side. Corium with veins greatly reduced, disc transversely rugose. Membrane reduced to a narrow, opaque area four and one-half times as long as wide, without visible veins.

Type of genus: *Oreonysius rugosus* sp. n.

Oreonysius runs to the New Zealand *Brachynysius* Usinger (1942*b*) because of its convex hemielytra and reduced membrane. However, *Brachynysius* differs in its smooth surface, erect pubescence, stout legs, etc. Actually *Oreonysius* is quite close to typical *Nysius*, and may eventually prove to be no more than a specialized off-shoot of this world-wide genus. On the basis of presently accepted generic characters, however, it cannot be placed in the genus *Nysius*.

Oreonysius rugosus sp. n.

Broadly rounded posteriorly, attenuated anteriorly, convex above, the head, pronotum and scutellum coarsely punctured, hemelytra finely, transversely rugose. Upper surface clothed with a fine, appressed pubescence. Colour largely black.

Head including eyes, wider, than long, 57:45; the eyes less than half as wide as interocular space 13½:30; vertex convex at middle, coarsely, rugosely punctate. Bucculae gradually decreasing posteriorly, not reaching base of head. Rostrum reaching hind coxae, the first segment short, reaching only three-fourths of the distance to base of head; proportion of segments one to four as 27:25:20:23. Antennae longer than head, pronotum and scutellum together, 125:113; proportion of segments one to four as 23:35:25:42.

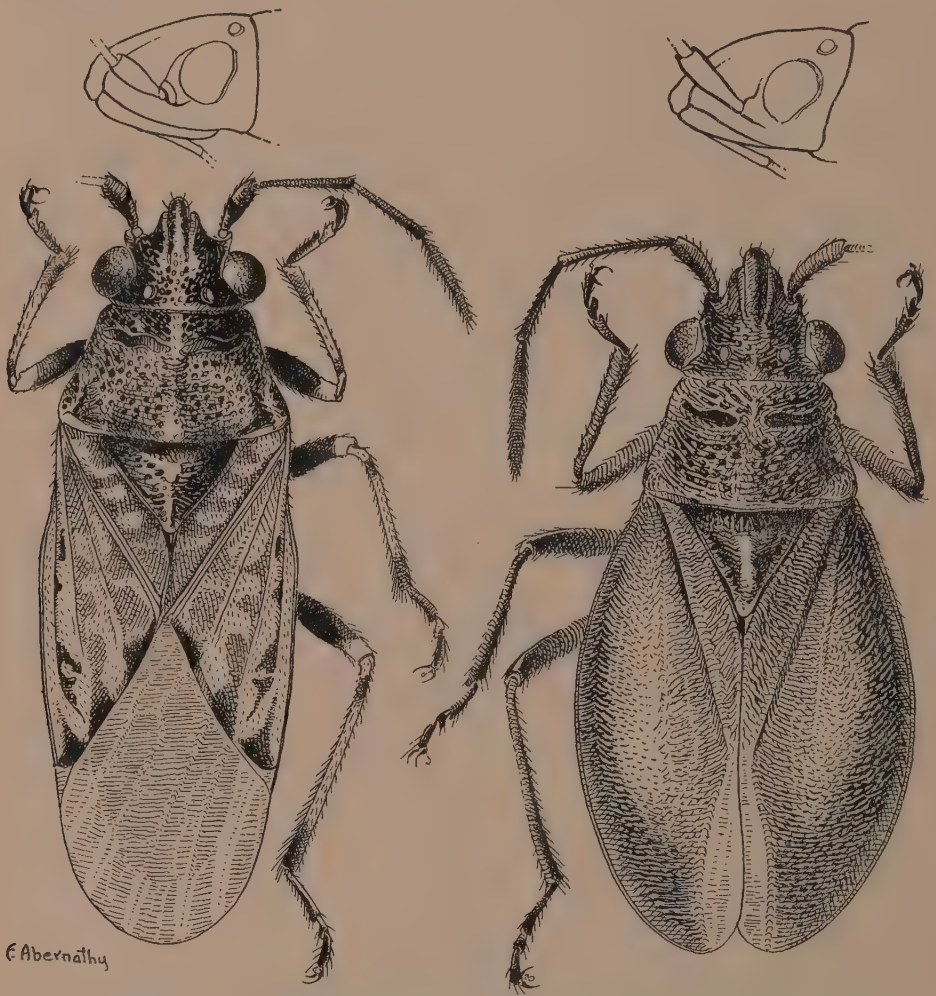


FIG. 1.—Orsillini from Kilimanjaro. Left, *Nysius salti* sp. n., with side view of head showing short but elevated bucculae. Right, *Oreonysius rugosus* gen. et sp. n., with side view of head showing short, tapering bucculae.

Pronotum shorter than head, 40:45; over half again as wide across postero-lateral angles as long, 64:40, the sides convex at level of callosities, feebly concave at middle, the postero-lateral angles rounded, not prominent, the disc moderately convex, sub-depressed at middle, depressed sublaterally near humeri, the surface with widely spaced, coarse punctures covered, except on glabrous callosities, by dense, depressed pubescence.

Scutellum broader than long, 42:35, strongly elevated at middle and apically coarsely punctured in lateral depressions.

Hemielytra entirely coriaceous except for narrow, opaque remnant of the membrane, slightly exceeding tip of abdomen and dilated well beyond sides of abdomen. Corium strongly convex; costal margin depressed, very narrowly reflexed, dilated from the base, slightly sinuate subbasally, with a few ill-defined punctures along inner side; disc finely, transversely rugose, vein R + M obscured, Cu visible only with transverse lighting. Clavus long, slender, merging with narrowed base of membrane, the commissure approximately as long as scutellum, claval suture strongly depressed, marked by a dense row of punctures which are visible only in lateral view. Membrane four and one-half times as long as wide, opaque, without visible veins.

Under-surface as in typical *Nysius*, the postero-lateral angle of metapleuron slightly produced, rounded. Female genital segments set in three-fifths of the distance to base of abdomen, the fourth and fifth visible segments greatly reduced at middle.

Legs as in typical *Nysius*, the hind tarsal segments in the proportion of 20:6:11.

Colour largely piceous, dark brown to black; light brown to ochraceous along inner margins of eyes; a small spot at middle of base of vertex, apex of scutellum, labrum, bucculae, anterior margin of prosternum, acetabula, scent gland ostioles and hind margins of metapleura. Appendages brown with slightly paler joints.

Size: Length 3·6 mm.; width (pronotum) 1·1 mm.; (hemielytra) 1·8 mm.

Holotype, ♀, No. 1095, Tanganyika Territory: Kilimanjaro, 27.x.1948, 14,500 ft. (*G. Salt*), taken among the scant vegetation beside a stone on the Saddle. Type deposited in the British Museum (Nat. Hist.).

Preliminary Key to the Genera of Orsillini.

In previous keys Stål (1874) treated five genera (two as subgenera), Horváth (1890) recognised four subgenera from the Palaearctic Region, and Evans (1929) keyed out seven genera for the World (raising all subgenera) and noted an eighth genus which he had not seen. In the present key I recognise fifteen genera, four subgenera, six synonyms and two homonyms. *Paranysius* Horváth, *Orsillacis* Barber and *Emphanisis* China have been referred to the Orsillini at one time or another but belong to the Lygaeini. *Mesostates* Reuter belongs in the Cyminae.

Anorthuna Strand (1928) (= *Anorthus* Horváth, 1890) was based upon the single species *atlantidum* Horváth from the Azores. It was described as a subgenus of *Nysius*. My notes, based upon an examination of the female type which is in the private collection of Dr. Henri Schouteden, are quoted: "A typical *Nysius* but with the hemielytra, including the membrane, polished white with brown markings. Body densely, finely pubescent. Antennae unusually long. Bucculae short, not reaching base of head, tapering posteriorly. Rostrum reaching hind coxae, the first segment not reaching base of head, scarcely exceeding bucculae. It is difficult to see why Horváth made a separate subgenus for this, the only unusual feature being the rather opaque white glaze on the hemielytra."

The status of *Camptocoris* Puton was clarified by Kiritshenko (1931) and *Nysiodes* Distant by China (1937). Although I have not studied specimens of *Camptocoris*, it seems certain that these two genera are identical, the distributional patterns being similar and the chief distinguishing character of each being the sexually dimorphic antennae.

The name *Pseudonysius* Bergevin referred to by Kiritshenko is apparently a *nomen nudum*. It is not mentioned by Neave, and I find no mention of it in the writings of Bergevin which I have been able to examine.[1]

The nomenclatorial status of the name *Nysius* Dallas is *sub judice* at the present time (*see* Usinger and Sailer, 1944, and *Bull. zool. Nom.* (*in press*)).

1. Surface of pronotum and hemielytra usually entirely naked except around callosities and at base of costal margin. Postero-lateral angles of metapleura usually either sharp right angles or prominently angulately produced. Claval suture bordered by two rows of very distinct punctures. Hawaii 2
–. Surface of pronotum and hemielytra pubescent. Postero-lateral angles of metapleura neither strongly produced nor abruptly cut off as right angles ; the hind margin moderately sinuate and the lateral angle subrounded. Claval suture either impunctate or with punctures so fine that they are scarcely visible except basally . . 4
2. Head produced before the eyes for a distance equal to or greater than length of eyes. Eyes small. Vertex over twice as broad as an eye, distinctly elevated. Postero-lateral angles of metapleura usually right angles . . . . . **Oceanides** Kirkaldy, 1910
–. Head produced before the eyes for a distance less than length of an eye. Eyes very large, appearing substylate. Vertex less than twice as broad as an eye. Postero-lateral angles of metapleura usually strongly produced 3
3. Antenniferous tubercles laterally carinate, the carinae extending back to inner anterior margins of eyes. Pronotal and hemielytral discs with ochraceous, laevigate elevations. Meso- and metapleura very strongly punctate . . . . . **Glyptonysius** Usinger, 1942
–. Antenniferous tubercles not laterally carinate. Pronotal and hemielytral discs without irregular laevigate elevations. Meso- and metapleura usually feebly irregularly punctate. Subgenera *Icteronysius*, *Physonysius*, *Leionysius* and *Trachynysius* Usinger, 1942 **Neseis** Kirkaldy, 1900
4. Eyes stylate, the head broader, eyes included, than pronotum behind. Hawaii . . . . . **Nesomartis** Kirkaldy, 1907
–. Eyes smaller, the head narrower than pronotum behind 5
5. Hemielytra usually very short, simply rounded pads, or complete with greatly reduced membrane with no visible veins at all (rarely complete in *Nithecus*, in which case the two inner veins of the membrane are not joined by a cross-vein) 6
–. Hemielytra complete, reaching at least to tip of abdomen. Membrane with distinct veins, of which the two interior ones are joined by a cross-vein 9

[1] Dr. W. E. China writes (*in litt.*, 12 Sept., 1951) " *Pseudonysius* is a valid genus established by Bergevin in 1921 (*Bull. Soc. Hist. nat. Afr. N.* **12** : 200, type *Nysius longicornis* Puton). Bergevin regarded *Pseudonysius* as distinct from *Leuconysius* Poppius (1912), type *L. biskrensis* Popp., which Kiritshenko (1931) later sank as a synonym of *Camptocoris* Puton (= nom. nov. for *Camptonotus* Jakovlev, 1885). Kiritshenko evidently followed Bergevin in this opinion, since he does not give *Pseudonysius* in his synonymy of *Camptocoris*. According to Bergevin *Pseudonysius* differs from *Leuconysius* (i.e., *Camptocoris*) in the fourth antennal segment being more than 3 times as long as the first three together, in the prominence of the pronotal disc and in the swollen hind femora.

" *Nysiodes* (type *N. typus*) is a synonym of *Camptocoris* Puton, but *longicornis* Puton, which I wrongly placed (1937) in the genus *Nysiodes*, is the type of *Pseudonysius* Bergevin."

6. Head above with a broken " Y "-shaped, pale, impunctate area at centre and another on either side along inner margins of eyes. Sides of body subparallel. Antero-lateral angles of pronotum produced laterally as small lobes. New Zealand . **Hudsona** Evans, 1929
–. Head distinctly and rather evenly punctate between the eyes. Body strongly dilated and rounded posteriorly. Antero-lateral angles of pronotum not produced, rounded 7
7. Hemielytra usually abbreviated pads or, if complete, with distinct veins, the two inner veins of membrane not joined by a cross-vein. Palaearctic . . . . . **Nithecus** Amyot, 1890
–. Hemielytra complete but with a very small membrane without visible veins. Corium strongly convex 8
8. Corium smooth, polished, sparsely clothed with suberect hairs. Membrane half as " wide " as distance from apex of clavus to tip of membrane. New Zealand . . . . . **Brachynysius** Usinger, 1942
–. Corium transversely rugose, densely clothed with subappressed pubescence. Membrane one-fourth as " wide " as distance from apex of clavus to tip of membrane. Africa **Oreonysius** Usinger, gen. n.
9. Large, robust, shining species covered with long, erect hairs. Pronotum non-carinate at sides, the disc not abruptly flattened on anterior lobe. Posterior margin often with sublateral, plate-like expansions produced over basal angles of scutellum. New Zealand (= *Myersia* Evans, 1929) . . . . . **Rhypodes** Stål, 1868
–. Not as above, either smaller, less robust, or subdepressed and the posterior margin of pronotum never with sublateral lobes . . . 10
10. Body subdepressed or flattened above, almost twice as broad as deep. Bucculae but feebly elevated 11
–. Body narrower and more robust, less than twice as broad as deep. Bucculae distinctly elevated, at least anteriorly 12
11. Anterior femora spined beneath. Connexivum usually distinctly alternated (=*Mecorhamphus* Fieber, 1860, = *Macrorhamphus* Jakovlev, 1876) Palaearctic . . . . . **Orsillus** Dallas, 1851
–. Corial margins sinuate, either subparallel basally and then dilated, or dilated subbasally and then converging posteriorly. Cosmopolitan (= *Macroparius* Stål, 1872, = *Artheneis* Spinola, 1887) **Nysius** Dallas, 1852
–. Corial margins straight, subparallel or a little convergent posteriorly . 13
13. Anterior femora each with a stout spine beneath, located subapically on inner margin. American . . . . . **Belonochilus** Uhler, 1871
–. Anterior femora unarmed 14
14. Antennae sexually dimorphic, the fourth antennal segment in the male subequal to first three together (= *Camptonotus* Jak., 1885, = *Leuconysius* Poppius, 1912, and = *Nysiodes* Distant, 1918) **Camptocoris** Puton, 1886
–. Antennae alike in both sexes, the fourth segment much shorter than the first three together . . . . . **Ortholomus** Stål, 1872

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A NEW SPECIES OF THE GENUS *LEPTEA* BOLIVAR (ORTHOPTERA: ACRIDIDAE).

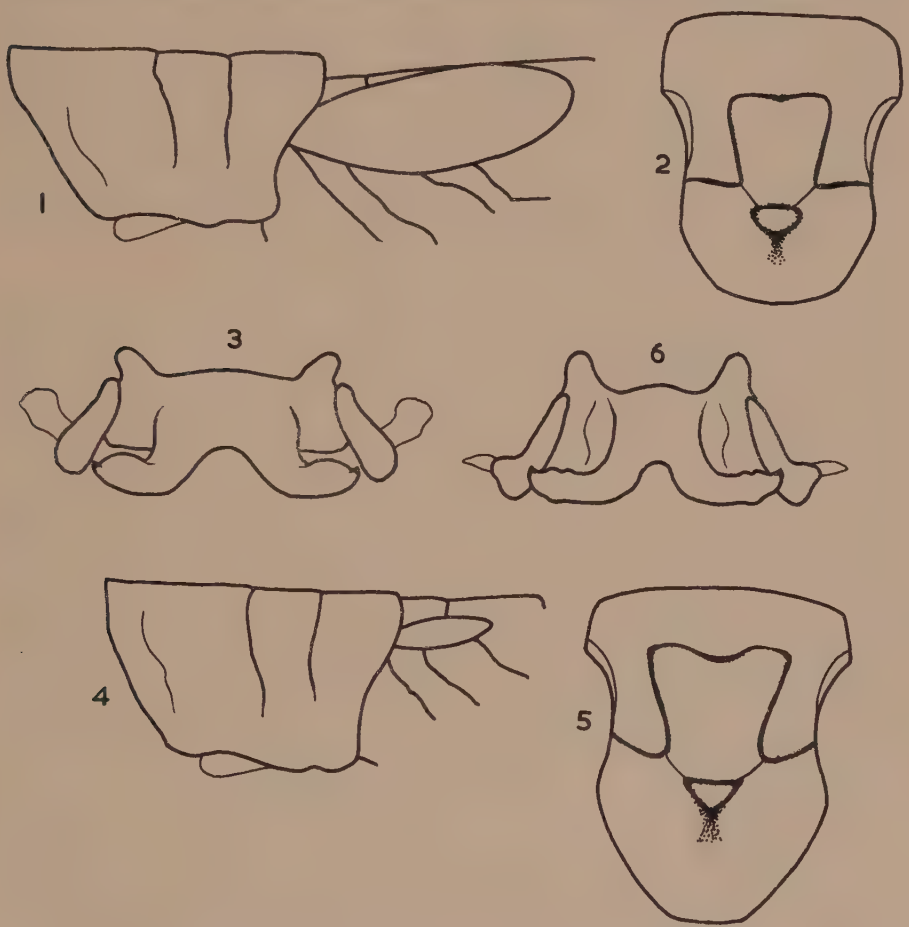
By V. M. Dirsh, D.Sc., F.R.E.S.

Leptea guichardi sp. n.

♂ Type: Small and slender.

Antenna slightly longer than head and pronotum together, of 14 segments, slightly compressed in the basal half, its apical segment elongate, four times as long as broad. Fastigium of vertex moderately long, with rounded apex. Frons, in profile, weakly incurved; frontal ridge with a narrow deep sulcus which is almost obsolete near the clypeus.

Pronotum (fig. 1) subcylindrical; median carina weak; lateral carinae scarcely marked in prozona; anterior margin straight, the posterior straight and weakly excised in the



Figs. 1–6.—(1–3) *Leptea guichardi* sp. n., male. 1, pronotum and elytron; 2, sternum; 3, epiphallus.

(4–6) *Leptea debilis* (Finot), male. 4, pronotum and elytron; 5, sternum; 6, epiphallus.

Proc. R. Ent. Soc. Lond. (B) 21. Pts. 9–10. (October, 1952).

middle ; lower margin of the lateral lobe sinuate ; the posterior excised. Two transverse sulci, the first in the middle of pronotum, the second at about posterior three quarters. Prosternum with a low, broad, transverse swelling. Mesosternal lobe (fig. 2) almost twice as long as broad, angulate, with slightly incurved hind margin ; mesosternal interspace large, as long as broad, broadening forwards with almost straight lateral and scarcely incurved frontal margin. Metasternal interspace small, broader than long, oval.

Elytra ellipsoid lobiform, as long as pronotum, touching one another dorsally, reaching to the apex of the first abdominal segment. Wing rudimentary.

Hind femur projecting beyond the apex of the abdomen. Lower lobe of the hind knee short and obtuse. Tarsal arolium large, rounded, longer than a claw.

Last abdominal tergite with a broad rounded excision on the apical margin. Supra-anal plate narrowly triangular, with obtuse apex. Subgenital plate short, in profile with obtuse apex. Cercus short conical, with acute apex.

Epiphallus (fig. 3) of the usual pyrgomorphine type, with strongly projecting upper lateral angles of the disc.

General coloration pale brown-ochraceous ; the head with indistinct brownish (upper) and sharp whitish (lower) lateral stripes, extending from the eye on to the lateral lobes of the pronotum.

♀ (paratype) : As the male, but larger. The metasternal interspace twice as broad as long. Subgenital plate with a small square excision on the apical margin. Ovipositor short and slender ; upper valve broad, with serrated upper margin, the lower narrow, with a small tooth on the external side. General coloration as in the male, but some specimens are pale green.

Length of body ♂ 11–12 mm., ♀ 15–17 mm. ; pronotum ♂ 2·4–2·6 mm., ♀ 4–4·5 mm. ; hind femur ♂ 5·5–6 mm., ♀ 8–8·5 mm. ; elytron ♂ 2 mm., ♀ 3·2–3·5 mm.

Tripolitania : Bianchi area, 25 m. S.W. of Tripoli, 15.vi.1951, 2 ♂ (including type), 2 ♀. Castel Benito, 29.vi.1951, 1 ♂, 5 ♀ (*K. M. Guichard*). Type in British Museum.

The genus *Leptea* was erected by I. Bolivar in 1904 for a single species, *Pyrgomorpha debilis* Finot, 1894, from Algeria. The new species differs from the type species by the following characters :

L. guichardi sp. n.	*L. debilis* (Finot).
Antenna slightly longer than head and pronotum together, compressed but not widened in the basal half.	Antenna shorter than head and pronotum together, compressed and widened in the basal half.
Mesosternal lobe angulate.	Mesosternal lobe rounded.
Mesosternal interspace with straight lateral and scarcely incurved anterior margins.	Mesosternal interspace with incurved lateral and strongly incurved anterior margins.
Metasternal interspace almost oval.	Metasternal interspace broadly triangular.
Elytron almost as long as pronotum, reaching the apex of the first abdominal tergite.	Elytron rudimentary, scarcely reaching the middle of metanotum, one-third the length of pronotum.
Epiphallus, *see* fig. 3.	Epiphallus, *see* fig. 6.

A NEW APHID GENUS FROM EAST AFRICA.

By H. L. G. Stroyan, M.A., F.R.E.S.

During 1950 Dr. George Salt, of the Department of Zoology, Cambridge University, gave me a small number of samples of aphids collected by him during November and December, 1948, in various localities in the region of Kilimanjaro, Northern Province, Tanganyika Territory. Not more than about half-a-dozen species in all were collected, but among these was a single species distinct from all previously described genera. All the available material was fragmentary, since the species is a delicate one and all the samples had been subjected to the normal soil sample extraction method ; but it seemed desirable nevertheless to describe it forthwith, as there was then apparently little likelihood of more specimens being readily forthcoming.

However, within the last two months a further sample of the same aphids has been received at the British Museum (Natural History), and thanks to Mr. J. P. Doncaster I have received some specimens which enable a fuller description to be made. There is, however, at present some slight doubt as to the provenance of this latter sample, since host plant and habitat data differ widely from those provided by Dr. Salt with the original samples. It is hoped to clear up this question by further inquiry at a later date.

Pterasthenia gen. n.

The genus belongs to the subfamily Callipterinae of Kloet and Hincks, or the family Callaphididae of Börner (1952). Its morphology places it in the subtribe Unipterina, the only other known genus of which is *Unipterus* Hall, 1932, also from East Africa.

Slender, elongate aphids, with only alate viviparous forms so far as is known. Head normal, with median ocellus rather ventrally situated, frons above ocellus (in normal dorsal aspect) a little concave. Antennae much longer than body, 6-jointed in adult alatae and last instar nymphs, 5-jointed in younger nymphs. Compound eye of newly-born nymph multi-faceted, with 13–15 ommatidia besides the triommatidion. Alatae with antennal joint III bearing roundish to transverse oval fringed secondary rhinaria in a single row. Primary rhinaria of ant. V and VI small, round, fringed and very inconspicuous. Ant. VI with processus terminalis exceedingly long, hardly demarcated from basal part of joint by any constriction ; the accessory rhinaria of this joint almost equal to the primary in size, and spread out in a well-spaced single row along the basal part of the joint, not grouped around the primary, which lies about level with the second accessory. Processus terminalis closely and regularly imbricate, apex with 3 sense hairs. Wing venation very weak and reduced, although the fore wings themselves are ample ; Rs in the fore wing is almost straight, ending below the apex of the wing ; M is entirely unbranched, and both it and Cu1 are poorly marked : Cu2 is markedly recurved and strongly dark-bordered ; pterostigma elongate, conspicuously pigmented and occupying a large part of the length of the costa ; membrane almost devoid of microscopic spinulosities except round pterostigma and on posterior margin. Hind wing with only one very weak transverse vein and 2 hamuli. Rostrum with basal apodemes of 2nd joint simple, not turning down to form a sclerotised basal ring. Siphunculi smooth, obliquely truncate and somewhat tapering, without any apical flange or rim, with a wide open porus controlled by two conspicuous triangular

sclerotised internal apodemes. Cauda with an elongate knob, broadest and deepest anteriorly ; subanal plate deeply bilobed. First tarsal joints with 2 dorsal, 2 medio-ventral and 4 apical ventral hairs. Empodial hairs simple. Tibiae with very sparse hairs and without smaller spinulose hairs apically between the normal ones. Front femora very long and thick in proportion to the other pairs, with a very long articular foramen at the femorotibial joint ; front tibiae with base swollen just below articulation. Gonochaetae in four pairs on four very small gonapophysis-rudiments.

Type of genus *Pterasthenia shiraensis* sp. n.

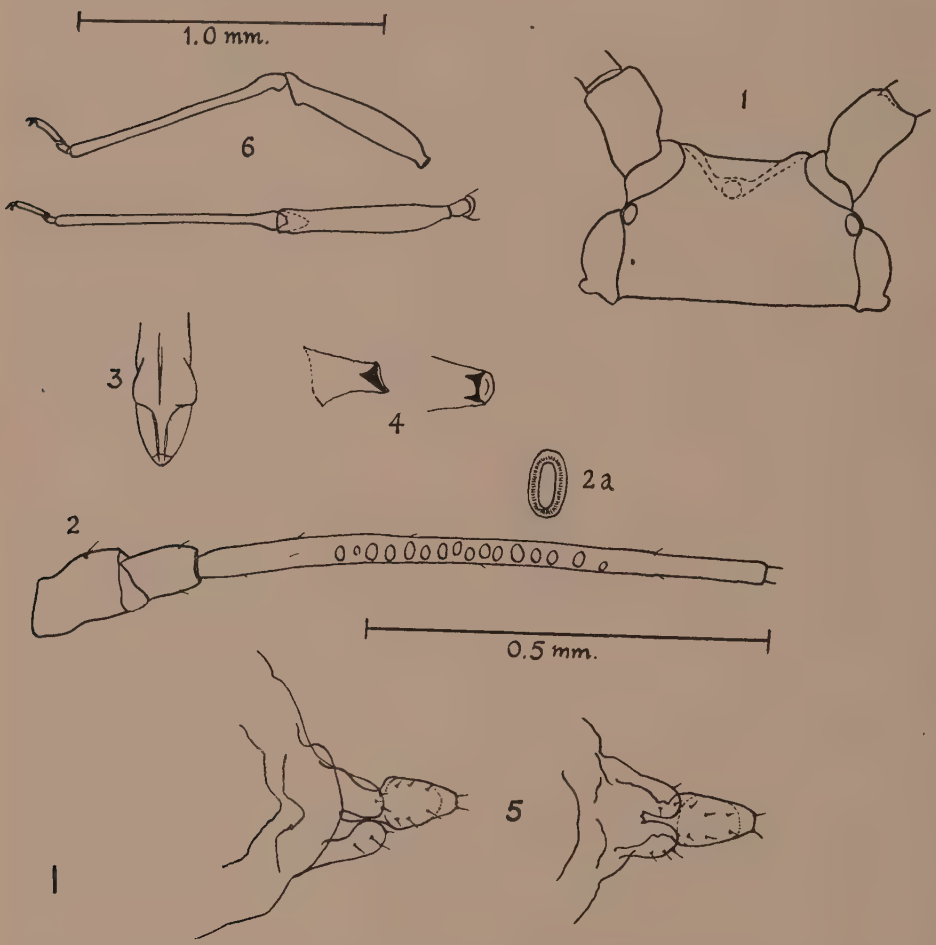


Fig. 1.—(1) *Pterasthenia shiraensis* sp. n., al. viv. ♀, head, dorsal ; (2) antenna, joints I-III ; (2*a*) secondary rhinarium further enlarged ; (3) apex of rostrum (hairs omitted) ; (4) siphunculi, dorsal and anterior aspects ; (5) apex of abdomen of two specimens, showing cauda and subanal plate ; (6) front leg, dorsal and anterior aspects. (All drawings to scale by microprojector, scales as indicated.)

Pterasthenia shiraensis sp. n.

Alate viviparous female : Body rather elongate, 1·6 to 2·0 mm. long. Head normal, frons slightly concave. Frontal and antennal hairs rather small, acute, and very fine ;

hairs on ant. III up to about 11μ long, or from $\frac{1}{3}$ to $\frac{2}{3}$ articular diameter of joint. Ant. I abruptly widened on inner margin at about $\frac{1}{3}$ its length, about 1·2 × as long as ant. II. Ant. III dark sclerotic, paler on basal and apical quarters, with 8 to 16 secondary rhinaria in a single row from about $\frac{1}{4}$ to $\frac{3}{4}$ (i.e., on the darkest part of the joint); ant. IV pale with slightly darker apex; or this joint and V may be practically unicolorous. The exact length of the processus terminalis is not known for the adult, as no specimen has yet been seen with the processus whole. Vertex of head, joints I and II of antennae and central area of pronotum with a scattered sculpture consisting of minute, apparently rosette-shaped spinules. Imbrications on remainder of antennae, apart from joint VI, fine and inconspicuous. Lateral ocelli placed far forward, contiguous with anterior inner margin of compound eyes. The frontal region of the head has a conspicuous V-shaped ridge formed by two inwardly and ventrally running sclerotic ridges which originate from the lateral prominences at the base of the antennae and converge on the median ocellus, which their confluence surrounds anteriorly and laterally. Rostrum reaching about to second coxae or not so far; apical joint short and blunt, with 6 hairs besides the 3 apical pairs. Fore wing about 2·4 mm. from base to apex, pterostigma extending from a little over $\frac{2}{5}$ nearly to apex. Hind wing small, about 1·2 mm. long. Siphunculi darkly pigmented, about 0·05 to 0·09 mm. long. Cauda rather large, 0·13 to 0·18 mm. long, knobbed with a strongly marked downward expansion below the proximal part of the knob; the lateral borders of this expansion bear 3 pairs of stiff hairs, and 2 further pairs are borne subapically and apically on the terminal part of the cauda. Subanal plate deeply cleft, forming two almost parallel-sided lobes; the base of the cleft lies approximately below the constriction between the basal part of the cauda and the knobbed part; each lobe bears about 5 stiff hairs. Abdomen without dorsal processes or sclerotic markings. Margins of abd. segments bearing flat, inconspicuous tubercles, the first pair of which are rather more outstanding and backwardly directed, bearing a small hair apically. Ventral hairs of abdomen normal, acute, of moderate length, arranged in transverse segmental rows. Subgenital plate hairless. Front femora constricted at base.

Measurements of alate viviparous females:

Body.	Antennal joints.				Siph.	Cauda.	Ap. jt. rostrum.	2nd jt. h. tarsi.	Rhin. on ant. III
	III.	IV.	V.	VIb.					
1·68	0·67	0·47	0·41	.	0·08	0·13	0·08	0·13	14 & 15
1·86	0·70	0·48	.	.	0·09	0·16	0·08	0·14	15 & 16
1·74	0·69	.	.	.	.	.	.	.	14 & 14
?	0·61	0·43	.	.	.	.	0·07	.	11 & 13
1·79	0·59	0·40	0·35	0·15	0·06	0·16	0·07	0·13	11 & 11
1·60	0·64	0·40	.	.	0·06	0·16	0·08	0·13	10 & 10
?	0·65	0·42	0·38	0·15	0·07	0·18	0·08	0·14	14 & 12
1·60	0·58	0·38	0·35	0·16	0·08	0·16	0·07	0·13	13 & 10
1·60	0·56	0·38	.	.	0·06	0·14	0·08	0·13	10 & —
1·92	0·60	0·40	0·38	0·14	0·07	0·16	0·08	0·13	12 & 12
1·90	0·62	0·38	0·38	0·18	0·07	0·17	0·07	0·13	8 & 8
1·84	0·64	0·41	0·37	.	0·07	0·18	0·08	0·14	11 & 11
1·64	0·65	0·43	0·37	0·15	0·07	0·16	0·07	0·12	12 & 13
1·81	0·62	0·41	0·38	0·16	0·05	0·15	0·07	0·13	12 & 12
1·89	0·68	0·45	.	.	0·08	0·18	0·08	0·14	12 & 11
1·97	0·64	0·40	0·38	0·18	0·07	0·17	0·08	0·13	9 & 10

All lengths measured in mm. The length of joint VIb of the antennae is given to the distal border of the primary rhinarium, which lies alongside the second accessory.

Specimens 1–4 above are from soil samples under grass tufts. TANGANYIKA TERRITORY: Kilimanjaro, xi–xii.1948 (*G. Salt*); Nos. 5–16 are from *Commi-*

phora sp. leaves, KENYA: Nairobi 5.i.1951 (*G. de Lotto*). Nos. 1–4 are deposited in the British Museum of Natural History as the type series; Nos. 5–16 are in my collection.

Nymph (*1st instar*): Head broad, frons slightly convex, sinuate, without marked lateral prominences. Compound eye with about 13 ommatidia besides the triommatidion. Antennae 5-jointed, 1·44 × as long as body, joint V more than 1·25 × joints I–IV taken together, and without clear demarcation of the very long processus terminalis, which tapers gradually to apex; accessory rhinaria spaced as in adult. First tarsal joints apparently 2-haired. Measurements: Body 0·72 mm., antenna 1·04 mm., joint ratios III–V 19 : 16 : 13 + 46, width of frons between antennal bases 0·13 mm., apical joint of rostrum 0·06 mm., 2nd joint of hind tarsus 0·09 mm.

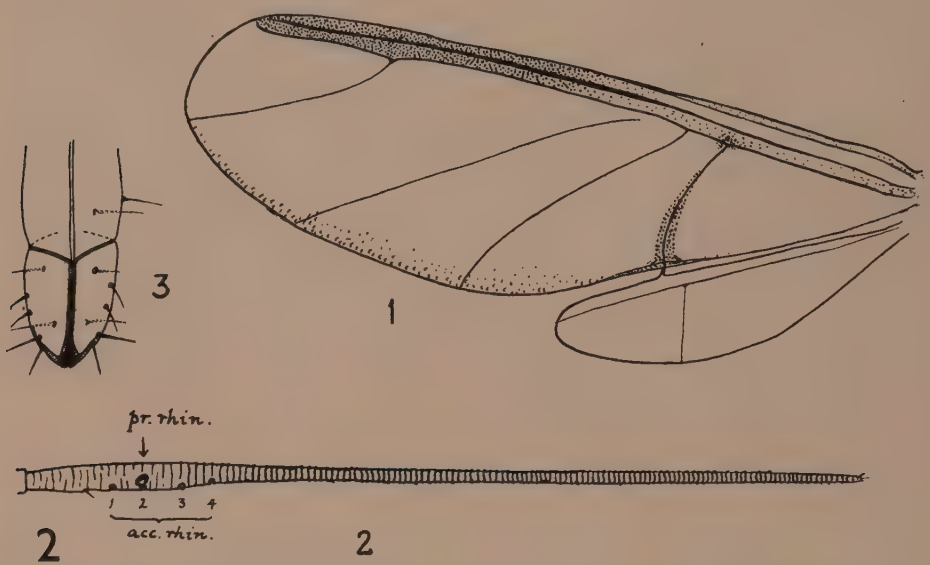


FIG. 2.—(1) *Pterasthenia shiraensis* sp. n., al. viv. ♀, wings; (2) nymph (2nd instar), apical antennal joint; (3) nymph (mature), apical joint of rostrum, showing chaetotaxy. (All drawings free-hand from mounted specimens, scales variable.)

Nymph (*2nd instar*): Very similar to 1st instar, but first tarsal joints apparently 4-haired, and measurements as follows: Body 1·02 mm., antenna 1·38 mm., joint ratios III–V 31 : 20 : 78, 2nd joint of hind tarsus 0·10 mm.

Nymph (*last instar*): Antennae 6-jointed, first tarsal joints 6-haired, measurements as follows: Body 1·65 mm., antenna 2·08+ mm. (processus broken), joint ratios III–V 46 : 38 : 37 siph. 0·06 mm., cauda 0·13 mm., apical joint of rostrum 0·07 mm., 2nd joint of hind tarsus 0·14 mm.

Taxonomic Affinities.

Pterasthenia, as has been pointed out to me in discussion by Dr. Hille Ris Lambers, lies close to the genus *Unipterus* Hall. The features in which it resembles *Unipterus* are the small size and slender, delicate build; the reduced and specialised wing venation, in particular the straight Rs ending below the fore wing apex, the reduction of M, the recurved and strongly dark bordered Cu2 and the long pterostigma; the structure and arrangement of the secondary

rhinaria on the strongly darkened third antennal joint; the enlargement of the front femora; and the structure of the cauda and subanal plate.

Points of difference between *Pterasthenia* and *Unipterus* are the much longer antennae and processus terminalis in *Pterasthenia*; the separation of the accessory rhinaria on ant. VI; the greater reduction of the wing venation (M is simple in *Pterasthenia*, once branched in *Unipterus*; and the hind wing has only one cross-vein against two in *Unipterus*); and the fact that the 1st instar nymph has multi-faceted eyes, while that of *Unipterus* is said to have merely a triommatidion.

Together *Pterasthenia* and *Unipterus* make up a small natural group so far known only from East Africa, which can apparently best be regarded as a subtribe of the Drepanosiphonini of Börner. The structural features which point to this relationship are: (1) the enlargement of the front femora in both known genera, which is strongly similar to the condition seen in both *Drepanosiphum* Koch and *Drepanaphis* Del Guercio; (2) the fringed structure of the secondary rhinaria; (3) the tendency for the accessory rhinaria of ant. VI to move apart from the primary, which is well seen in *Pterasthenia* and also to a lesser extent in *Drepanaphis*; (3) the absence of a sclerotic basal ring round the posterior (dorsal) aspect of the base of the 2nd rostral joint; and (4) the marked elongation in *Pterasthenia* of the processus terminalis.

The subtribes of the Drepanosiphonini will key out as follows:

1. Median vein of f-w. simple or once branched; radial sector nearly straight, ending below wing apex. Siphunculi short, truncate and flangeless . . . . . **Unipterina.**
2. Median of f-w. twice branched; Rs curved anterad, ending above wing apex. Siph. elongate, basally swollen and usually with a very distinct apical flange . . . . . **Drepanosiphonina.**

Biology and Distribution.

The original samples collected by Dr. Salt were all from beneath tufts of grasses of various species, except for one record from beneath a *Helichrysum*. The localities and altitudes of the samples were as follows:

1. Kilimanjaro: Shira Plateau, 12,450–14,000 ft. above m.s.l., 28/29.xi.48 (1 fragmentary alata, 5 nymphs, 2 cast skins).
2. West Kilimanjaro, 6370 ft., 1.xii.48 (1 alata).
3. Machame, 5500 ft., 18.xii.48 (2 alatae).

4 and 5. Fragments and cast skins also seen from Lyamungu, 4300 ft., 16 and 27.xii.48, and Arusha Chini, near Moshi, 18.xii.48.

The grasses from beneath which the samples were taken are recorded as follows: at 2300 ft., *Cenchrus ciliaris* L. (African Foxtail) and *Sporobolus indicus* R. Br.; at 4300 ft. (Lyamungu), *Cynodon plectostachyum* Pilger (Giant Star Grass); at 5500 ft. (Machame) *Pennisetum clandestinum* Hochst. *ex* Chiov. (Kikuyu Grass), at 6370 ft. (West Kilimanjaro), *Cynodon dactylon* Pers. (Star Grass); and from 12,450–14,000 ft. (Shira Plateau), *Pentaschistis minor* Ballard and Hubbard and *Koeleria cristata* Pers. var. *supina* Engl. *ex* C. E. Hubbard.

The more recent sample, labelled Nairobi, arrived among a consignment sent for identification to the British Museum. The tubes making up this consignment were found to be in some confusion on arrival, as in some cases

tube numbers and data did not agree with each other. After some careful sorting by Mr. J. P. Doncaster and Dr. Hille Ris Lambers it came to appear that the sample in question had been collected, along with a sample of a new species of *Unipterus*, from a species of *Commiphora* (Burseraceae). This, if true, indicates a rather unusual kind of polyphagy for *Pterasthenia*; and in view of the circumstances it seems advisable to leave discussion of this point until further investigations have been made into the occurrence of the species on *Commiphora*. It seems sufficient to indicate at present that the geographical range includes parts of Tanganyika Territory and Kenya Colony, and the altitudinal distribution ranges from about 2300 to 14,000 ft. above mean sea-level. The presence of nymphs in all stages in Dr. Salt's samples shows that development can occur in the field on a number of species of grasses, and at altitudes where *Commiphora* is quite absent from the very meagre flora.

Acknowledgments.

My best thanks are due to Dr. George Salt for the provision both of the original material of *Pterasthenia shiraensis* and of much relevant and detailed information about local floristic and climatic conditions on the upper regions of Kilimanjaro. Mr. J. P. Doncaster very kindly provided further material from the Kenya find of the species, and to him also I owe many thanks.

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Book Notice.

Forest Entomology. By Samuel Alexander Graham. The American Forestry Series. 3rd edn. New York and London (McGraw Hill), 1952. Pp. xii + 351, text illust. Price $6.00 or 51*s*.

Since 1929, when the first edition of this work was published, great advances have been made in the study of forest entomology. The changes in control techniques and other developments have necessitated almost a complete re-writing of the text, so that the third edition, which is almost a new book, emphasises the practical and ecological aspects of the subject.

The sections on chemical control have been rewritten to give a modern presentation of methods of applying insecticides, and new chapters have been added describing methods of forest insect surveys.

As it is a book on forest entomology rather than on forest insects, the species discussed are selected to illustrate principles that are, or may be, used to protect forests from insect ravages.

The bibliography is arranged by chapters, and the general index also indicates the page on which relevant references are listed.

ON THE SYSTEMATIC POSITION OF THE GENUS *CTENIDIA* CASTELNAU, 1840 (COLEOPTERA). (CONTRIBUTION XXXIV TO THE KNOWLEDGE OF THE MORDELLIDAE.)

By Mario Franciscolo.

(*Genoa, Italy.*)

Ctenidia was established by de Castelnau, who placed it in the Rhipiphoridae, and noted that it was closely allied to the Mordellidae. Lacordaire added some generic characters and, while retaining it as a Rhipiphorid, emphasized that it formed a link between the Rhipiphoridae and the Mordellidae.

The genus *Ctenidia* is still monobasic, and the distribution of its species, *mordelloides* Castelnau, seems to be limited to the extreme south of South Africa (Cape Town, Caffernland, Albert District, Orange).

By courtesy of Dr. A. Hesse (Cape Town Museum) and Dr. G. Van Son (Transvaal Museum, Pretoria) I have received a loan of Mordellidae and Rhipiphoridae, amongst which I found six males and seven females of *Ctenidia mordelloides* from the following localities: Albert District: Burghersdorp. Steinsburg District: Knervslagte. Willowmore District: Willowmore (these determined by Dr. Van Emden, in 1933).

After a comparative analysis of all available morphological data I have concluded that the genus *Ctenidia* cannot be retained in the Rhipiphoridae, but must be considered a true Mordellid, representing a well-defined subfamily, to which I gave the name Ctenidiinae in an earlier paper (1951, *Atti Soc. ital. Sci. nat.* **90** : 56).

The following is a re-description of the type species.[1]

Ctenidia mordelloides Castelnau.

1840, De Castelnau, *Hist. Nat. Ins., Col.* **2** : 264
1855, Gerstaecker, *Rhipiph. Disp. Syst.* : 13–14.
1859, Lacordaire, *Gen. Coléopt.* **5**, 1 : 619–620.
1951, Franciscolo, *Atti Soc. ital. Sci. nat.* **90** : 56, etc.

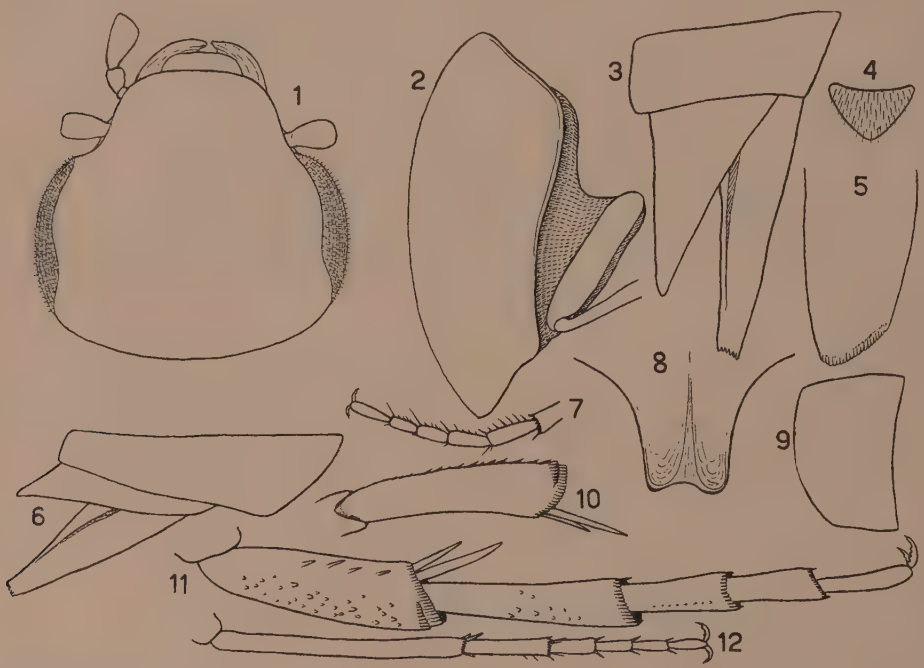
Male.—Width of head, 1·4–1·8 mm.; pronotum, 1·7–2·1 mm.; elytra, 1·6–2 mm.; length of head, 1·2–1·5 mm.; pronotum, 1·5–2 mm.; elytra, 4·5–5·5 mm.; pygidium, 1·3–1·4 mm.; totals, 8·5–10·4 mm.

General shape long, narrow, feebly attenuated towards the apex of the elytra. The facies resembles that of a large specimen of *Stenalia stypae* Chob. (excepting the form of the antennae). Colour of integument brown-black; galea reddish; anterior and middle legs and posterior tarsi reddish-brown, often very dark. Elytra with lateral margin, suture and extreme apex and a part of base brownish-black; remainder yellowish-brown.

Head (figs. 1, 19, 20): Ratio maximum width/ maximum length 11 : 10. Angle between occipital and temporal margins behind the eyes, which in the Mordellidae is normally pronounced, completely obsolete. Sculpture of upper surface, on the frons, vertex and occiput consists of a deep, circular and sparse punctuation, with interspaces very finely reticulated; the reticulation near the ocular margins being more rough and impressed, until it replaces entirely the punctuation; head beneath almost entirely shining, with sparse and large punctures, mainly below eyes. Pubescence golden-whitish, sub-erect, clearer and longer on

[1] Descriptions of shape, which are duplicated by the figures, have been omitted.

the front and on the temples. Eyes complete, oval, very little protruding, very finely granulated and densely pubescent. Mandibles very large, robust (fig. 26), bearing at inner side a membranous, large and fringed blade, almost reaching the apex; this blade is in effect the mola. Maxillae (figs. 28, 29) of a yellow-reddish colour. Maxillary palp (fig. 22) piceous, hardly longer than the galea; area papillaris of 4th segment extremely reduced, limited only to the front surface of the outer side, but extended all along its length. Labium (fig. 25) reddish-yellow, darker at apex and at sides, suboctagonal. Labial palp (fig. 27) of three segments, pale yellow, length about two-thirds of maxillary palp. Antennae (fig. 23) inserted in front of eyes, at sides of the frons (figs. 1 and 19), with an average length one and one-third times that of head; when folded backwards hardly reaching the basal corners of the pronotum, entirely black-piceous; segments 5 to 10 bear a single, long and

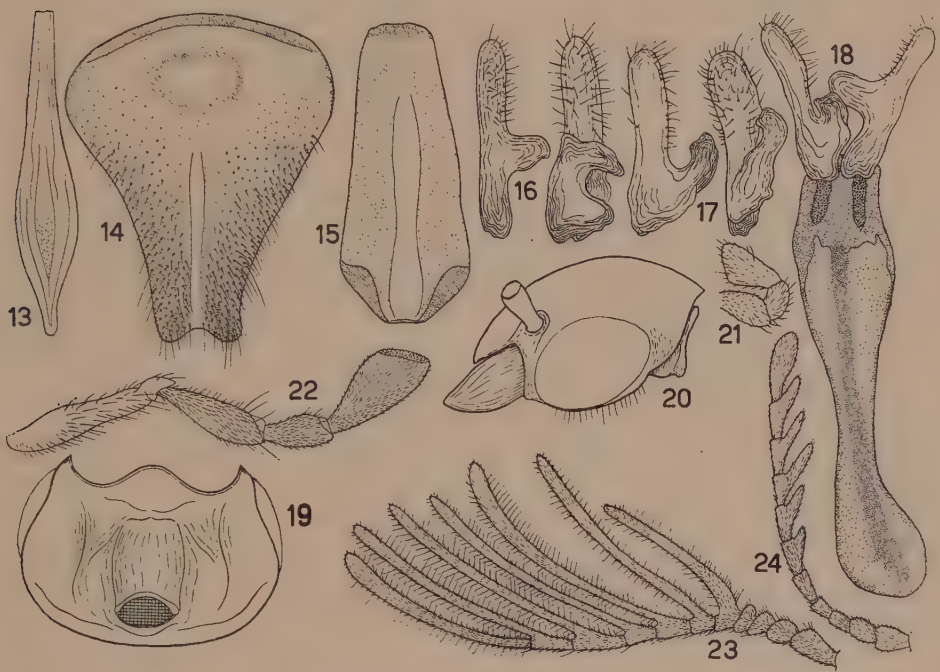


Figs. 1–12.—*Ctenidia mordelloides* Cast. (1) Head (male), Steinsburg, x.1935. (2) Pronotum, lateral view (male). (3) Three last segments of abdomen (male). (4) Scutellum (male). (5) Apex of left elytron (male). (6) Two last abdominal segments (female). (7) Anterior tarsi (male). (8) Apophysis of hind coxae (male). (9) Left meta-episternum (male). (10) Right posterior tibia (male). (11) Right posterior leg (male). (12) Right middle leg (male).

thin flabellum; segments 5 to 11 covered with a minute and thin pubescence on entire surface, flabella and 11th segment covered with long and erect setulae.

Prothorax: Pronotum little longer than wide (as 14 : 13), one and one-sixth times as wide as head (fig. 2), entirely black. Punctuation very fine, of rather impressed, subcircular punctures, interspaces finely reticulated, rather shining; punctuation slightly rougher near basal lobe. Pubescence short, dense, velvety, yellow, intensely cupreous-purpureous shining, clearer and more dense on sides and on basal lobe. Prosternum extremely reduced, very roughly granulated; front coxae very close, tangential, widely opened posteriorly; pro-episterna extremely thin.

Mesothorax: Scutellum (fig. 4) black, covered by dense, long, recumbent setulae of a straw-yellow colour; only basal portion, usually covered by basal lobe of pronotum, is less pubescent. Elytra entirely covering wings, leaving uncovered the last urite, at the base as wide as the pronotum, contiguous to its base, together two and three-quarter times as long as wide at their bases, of a reddish-brown colour, often clearer, or testaceous, with darkened margins, covered by a fine, recumbent, straw-yellow pubescence, oriented chiefly towards outer margins on each elytron. Punctuation extremely fine, file-like, rather obsolete in middle third, with interspaces finely and transversely reticulated; epipleural margins of elytra, seen dorsally, almost exactly straight; seen from one side appearing convex at the first third, and slightly concave for the remainder. Epipleurae of elytra very narrow, visible only up to basal third. Apex of elytra as in fig. 5. Callus humeralis



FIGS. 13–24.—*Ctenidia mordelloides* Cast.—(13) Dorsal view of apex of penis, Steinsburg, x.1935. (14) 8th abdominal sternite (male). (15) 9th abdominal sternite (male), Albert District, Burghersdorp. (16) Left paramere, dorsal and lateral view (male of Steinsburg, x.1935). (17) Right paramere, dorsal and lateral view. (18) Ventral view of tegmen, with parameres (male of Burghersdorp). (19) Lateral view of the head (male, Steinsburg). (20) Ventral view of head (same specimen). (21) Female maxillary palp (last three segment) of Knervslagte. (22) Male maxillary palp (last three joints), of Steinsburg (x.1935). (23) Antenna of male (same locality). (24) Antenna of female (Knervslagte, x.1939).

obsolete. Meta-episterna (fig. 9) densely covered with yellowish-golden pubescence, thickly punctured. Posterior coxae (fig. 49) almost as large as metasternum; their dorsal margin, near elytra, bears a suture which neatly separates the margin itself from the rest of the coxa, clearly visible when elytra are folded. Normally, in the Mordellinae, this suture exactly meets with epipleural margins when elytra are folded, so that the semilunar space delimited by it is entirely covered by the epipleurae, but this is not the case in

Ctenidia. Apophysis of posterior coxae (fig. 8) entirely black, but with the apex of the two lobes dark brown.

Abdomen black, with posterior margin of each sternite 2 to 5 reddish-brown; pubescence very fine and dense, consisting of short setulae of a straw-yellow colour, all symmetrically oriented towards pleural margins of sternites; all sternites with dense and rough file-like punctuation. Proportions of sternites 2 to 5 as follows: 10 : 8 : 6 : 5 : 8. Pygidium and hypopygium as in fig. 3. Segments 7 to 8 are internal, and surround the 9th and 10th segments, which constitute the genital frame. Genital apparatus (figs. 13 to 18) of mordellid type; penis entirely free within the sclerite, which also encloses tegmen, at the apex of which are articulated the parameres; these are strongly sclerotised but rather symmetrical; the whole in turn enclosed by 8th and 7th segments. 8th segment as in fig. 14; 9th segment (fig. 15) entirely without hairs. Tegmen almost three times as long as parameres, strongly sclerotised at centre and apex (fig. 18). Right and left parameres as in figs. 16, 17. Penis (fig. 13) as long as tegmen and parameres taken together, filiform.

Anterior legs (fig. 7) yellow reddish, rather darkened near base of each femur; in many specimens tarsal segments 2 to 5 are almost black. Ratio of length of tarsal segments, 9 : 7 : 6 : 5 : 7.

Middle legs (fig. 12) dark red; basal part of femur, apical tibial spurs and tarsal segments dark brown. Ratio of length of tarsal segments, 15 : 8 : 6 : 6 : 9.

Posterior legs (fig. 11) black; spurs of tibiae reddish-brown, covered with dense, fine, shining golden pubescence. Femora extremely wide, flat, arcuate. Tibiae strongly dilated towards their apices, flat, obliquely truncate; for details of dorsal spurs and apical ridge see fig. 11. Ratio of length of tarsal segments, 35 : 18 : 15 : 16.

Female.—Width of head, 1–1·9 mm.; pronotum, 1·1–2·4 mm.; elytra, 1–2·3 mm.; length of head, 1·2–1·6 mm.; pronotum, 1·3–2·1 mm.; elytra, 3·2–6 mm.; pygidium, 0·7–1·1 mm.; totals, 6·4–10·8 mm.

The female differs from the male in the following characters: Maxillary palp (fig. 21). Head generally less large and convex, with shorter pubescence, without long, golden-whitish hairs, on frons. Antennae (fig. 24) not flabellate, all segments covered with dense, short, simple and recumbent pubescence, without erect hairs. Abdomen with all external segments testaceous reddish; ratio of sternites 11 : 9 : 10 : 8 : 5; pygidium and hypopygium of entirely different shape and dimensions (see fig. 6); only lateral ridges of pygidium darker, apex black; remainder testaceous-reddish. In the majority of the specimens available abdomen in female entirely covered by elytra. Front femora ciliated only near articulation with tibiae. Front tarsi more linear. Average ratios of length of anterior, middle and posterior tarsal segments: anterior, 13 : 7 : 6 : 4 : 7; middle, 16 : 10 : 8 : 6 : 9; posterior, 34 : 18 : 14 : 12.

General Considerations.

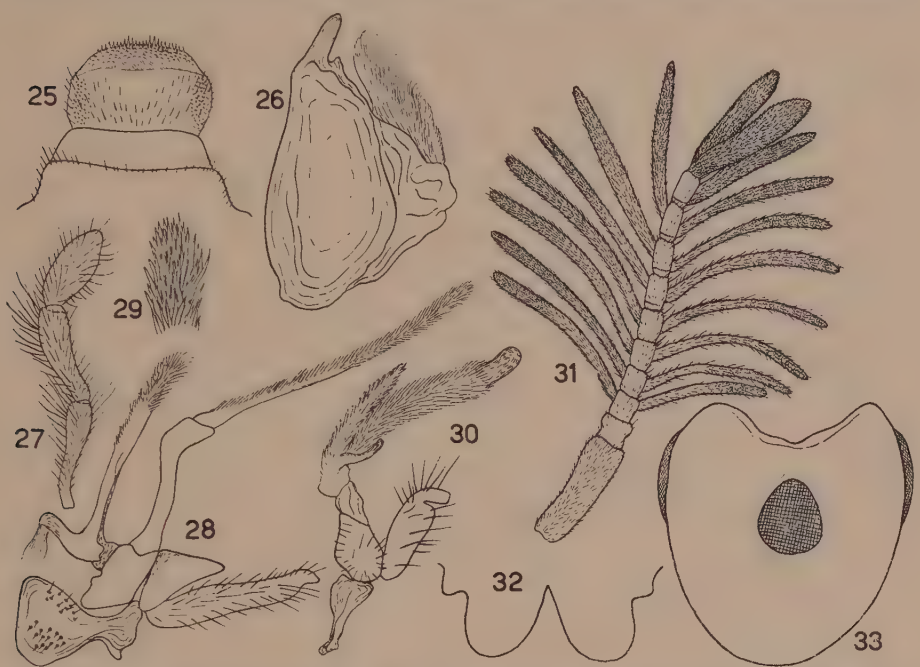
De Castelnau and Lacordaire placed *Ctenidia* in the Rhipiphoridae on the basis of one character only, the presence of flabellate antennae. Lacordaire was unable to examine the mouth parts owing to lack of material.

A comparative analysis of all available morphological data is therefore required in order to decide whether *Ctenidia* should be placed in the Rhipiphoridae or the Mordellidae.

Head: In the Rhipiphoridae there are three types of head form: In the Pelecotomini the occipital aperture is entirely located near the occipital margin, as in the Mordellidae, but the eyes are reniform and the antennae are inserted above the eyes. In *Ctenidia* the occipital aperture is near the occipital margin but the eyes are complete, not affected by the insertion of the antennae. In the Rhipiphorini (fig. 33) the occipital aperture is in the centre of the head and the occipital margin protrudes backwards in the form of a pointed lobe; the eyes are complete, subelliptic; the antennae are inserted between the eyes,

in the middle of the head. In the Rhipidiini (figs. 34–36) there is a third type, with the occipital foramen again near the occipital margin, but the antennae are inserted behind the eyes, above the occipital margin ; the eyes are complete. Therefore, as shown by the figures, the head of *Ctenidia* can in no way be considered to be of rhipiphorid type.

Maxillae : As shown in fig. 28, the galea in *Ctenidia* is articulated to the membrana articularis as is the lacinia, but they are entirely independent of each other and are joined at two different sides of the membrane ; this is the case also in all the Mordellidae ; in the Rhipiphoridae (see figs. 30, 38, 47) the galea and lacinia are articulated to the same point of the membrana articularis,



Figs. 25–33.—*Ctenidia mordelloides* Cast.—(25) Labium (male, Steinsburg). (26) Mandible. (27) Labial palp. (28) Maxilla and 1st segment of maxillary palp. (29) Apex of galea. (30) *Emenadia caffrum* Fähr., Hope Fountain, S.A., male maxilla and 1st segment of palp. (31) *Macrosiagon bipunctatum* F., Lichtenberg, Transv., leg. Brauns, male, antenna. (32) *Emenadia caffrum* Fähr., Hope Fountain, male : apophysis of hind coxae. (33) Same, ventral view of the head.

and are joined for a great part of their length. In *Ctenidia*, as in the Mordellidae, the apex of the galea is always more or less fringed or pointed, but it never bears a plate or a glabrous, sclerotized lobe, as in Rhipiphoridae. (In the *Pelecotomini*, however (fig. 38), the apex of the galea bears a long, simple fringe). On the other hand, the extreme length of the galea in *Ctenidia* recalls a typical rhipiphorid character.

Mandibles : In the Rhipiphoridae the mola is deeply sclerotized and is united with the mandible ; in *Ctenidia*, as in all the Mordellidae, the mola consists of a membranous and fringed blade (fig. 26).

Antennae : Though the form of the antennae in *Ctenidia* is by no means typical of the Mordellidae, comparison of figs. 23 and 24 with figs. 31, 37, 45, illustrating respectively the antenna of a *Macrosiagon*, *Pelecotoma* and *Emenadia*, demonstrates conclusively that they are not of a rhipiphorid type. In the Rhipiphoridae the first segment has the form of a true scape, whilst all the other segments are subcylindrical and subequilateral, of decreasing dimensions towards the apex of the antenna ; therefore segments 2 to 11 give the antenna a filiform shape ; in the males the flabella begin always at the 3rd segment (in *Ctenidia* at the 5th) and they are double for each of segments 3 to 11 (single in *Ctenidia*) ; the 11th, furthermore, is not transformed into a flabellum, but maintains its cylindrical form and bears at its distal margin two robust flabella. It is true that in the females of Rhipiphoridae, mainly in Pelecotomini (fig. 37), the similarity with the males of *Ctenidia* is a little more apparent, but this is probably a special character and in no way a proof that *Ctenidia* is a true Rhipiphorid.

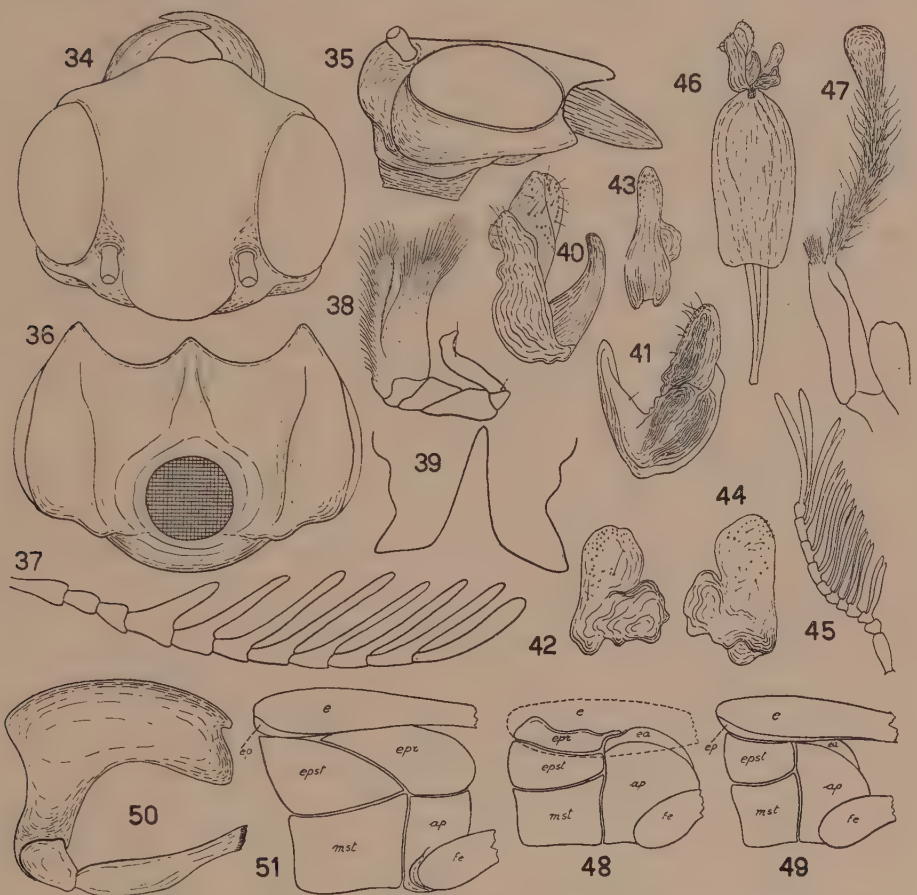
Prothorax : In current descriptions of the Rhipiphoridae it is usually stated that " the lateral margin of the pronotum is not bordered or margined " ; in effect, it should be said that the lateral wings of the notum, anteriorly, are curved downwards and reach the cotyloid cavities of the prosternum, so that, roughly, the section of the prothorax of a Rhipiphorid, cut at the level of the cotyloid cavities, should have more or less the form of a ∩, where the open space corresponds to the cotyloid cavities. In *Ctenidia* (and in the Mordellidae) the wings of the notum are never curved downwards, and are never contiguous to the cotyloid cavities of the prosternum (see fig. 2). In the Rhipiphoridae the notum, at its outer margin, is contiguous to the episterna of the mesothorax, which in this family are highly developed and much produced with respect to the base of the elytra, whilst in *Ctenidia* and Mordellidae the notum is entirely isolated from the meso-episterna and from the mesothorax itself, which is extremely reduced, not extending beyond the base of the elytra ; in effect, in *Ctenidia*, the prosternum is in contact with the mesothorax only by means of the pro-mesothoracic articulation. As a result, whilst in *Ctenidia* and Mordellidae the prothorax can move with respect to the mesothorax, as far as permitted by the cotyloid membrane, in the Rhipiphoridae the prothorax is firmly fixed and joined to the mesothorax without possibility of movement. This character is most evident in *Macrosiagon*, *Emenadia* and allied genera, where the greater movement of the head, owing to the medial position of the occipital aperture, compensates for the immobility of the prothorax (see fig. 51).

Mesothorax : In the Rhipiphoridae it is well developed and reaches, with the episterna, to the prosternal cotyloid cavities, and the episterna are entirely contiguous to the lateral margins of the pronotum, which is never the case in *Ctenidia* and Mordellidae.

Elytra : In *Ctenidia* they are of a mordellid type, and cannot be compared with the divaricated elytra of Rhipiphorini, or with those of Rhipidiini which are reduced to simple rectangular plates, not longer than the scutellum.

Metathorax : The metaepisterna are highly developed, both in Rhipiphoridae and Mordellidae ; but, whilst in the former they are not placed under the epimera and these are prolonged backwards, completely separating the coxae from the epipleural margin of the elytra, in the latter the epimera are above the episterna and are always hidden under the epipleurae of the

elytra when these are folded. This latter position of the epimera involves an enormous development of the hind coxae. In the Rhipiphoridae the coxae do not extend beyond the mesosterno-episternalis suture, and this is continued backwards by the epimero-coxalis suture; the coxae themselves are subtrapezoidal, narrow and short, never longer than the metasternum. In *Ctenidia* and Mordellidae the coxae are wide, in the form of a large semicircle, and the metasterno-coxalis suture is prolonged on the same line as the episterno-coxalis



Figs. 34–51.—(34, 35, 36) Three views of head of *Rhipiphorus subdipterus* Bosc d'Antic, male, Genoa, Italy. (37) *Pelecotoma* sp., Cape Town, female, antenna. (38) Same, maxilla and 1st segment of palp. (39) *Evaniocera capensis* Gerst., Bulawayo, South Rhod., 18.ii.23, male, apophysis of the hind coxae. (40–41) *Macrosiagon bipunctatum* F., Lichtenberg, Transv., leg. Brauns, male, right paramere, two views. (42, 43, 44) Same, left paramere, three views. (45) *Emenadia caffrum* Fähr., Kumba Mountains, South Rhod., 25.ii.38, male, antennae. (46) Same, aedeagus, without penis. (47) *Macrosiagon* sp., Zanzibar, maxilla. (48) *Mordella aculeata* L., Genoa, Italy, lateral view of metathorax: *e* = elytron, *epr* = epimerum, *epst* = episternum, *ea* = epicoxa, *ap* = coxa, *mst* = metasternum, *fe* = femur, *ep* = epipleura. (49) *Ctenidia mordelloides* Cast., same (lettering as in fig. 48). (50) *Emenadia caffrum* Fähr., prothorax. (51) *Emenadia caffrum* Fähr., lateral view of metathorax.

suture, while the epimero-coxalis suture is never visible without lifting the elytra. Figs. 48, 49, 51 show the shape and position of each lateral portion of the metathorax in *Mordella* (fig. 48), *Ctenidia* (fig. 49) and *Emenadia* (fig. 51).[2]

Abdomen : In the male of *Ctenidia* it is definitely of a mordellid type ; in the Rhipiphoridae, including Pelecotomini, the last external segment is extremely short, curved downwards, and in none of the various genera do we find a pygidium and hypopygium like those of Mordellidae and *Ctenidia.* In the females, even if the general shape recalls that of Rhipiphoridae, however, there are still a pygidium and hypopygium of a mordellid type ; in fact, though very short, they are much less shortened than in *Xanthoconalia* Franciscolo, *Cothurus* Champion and *Phungia* Pic (Mordellini).

Genital apparatus of the male : This apparatus in the Rhipiphoridae is of an entirely different structure : the parameres, always asymmetrical, and very similar to those of certain *Mordellistena* (figs. 40–44), are articulated to the tegmen, but this is extremely reduced, and joined to the sclerite (fig. 46). In the Mordellidae the tegmen is free and can move freely within the sclerite ; it has an elongate, rather narrowed form, at least twice as long as the paramere. It bears a sclerotised area near the base and along its middle. The genital apparatus of *Ctenidia* is, therefore, typically mordelloid.

Hind legs : In the Mordellinae, excluding *Reynoldsiella* Ray, the hind tibiae bear a pre-apical ridge, further evidence that *Ctenidia* is more closely allied to Mordellidae. In fact, as far as I know, a similar structure of the hind tibiae has never been reported in the Rhipiphoridae.

The following key serves to distinguish the genus *Ctenidia* from Rhipiphoridae and Mordellidae :

1 (2) Lacinia and galea articulated to the same side of the membrana artilaris, joined together at their base and along a large part of their length (figs. 30, 38, 47). Mandibles having the mola deeply sclerotized, neither laminated nor fringed, uniting with the base of the mandible itself. Antennae inserted above or behind the eyes. 1st segment in the form of a scape, much larger and longer than the following segments ; these, starting from the 3rd (males), always more or less flabellated, with double flabella ; females with flabellated antennae starting from the 4th segment, the flabella single (figs. 31, 37, 45). Eyes complete or reniform ; in the latter case antennae inserted in concave part of inner margin of the eyes (figs. 34, 35, 36). Pronotum with lateral margins contiguous as far as the mesothoracic episterna, which are extremely large ; mesothorax widely extended beyond base of elytra ; lateral wings of pronotum curved downwards, reaching prothoracic acetabula. Scutellum free or partially so, or entirely obtected by basal lobe of pronotum (fig. 50). Meta-epimera visible when elytra are folded, located above coxae ; these not reaching epipleural margin of elytra, usually rectangular ; apophysis of hind coxae deeply incised and bilobate (figs. 32, 39, 51) . . . . . **Rhipiphoridae**

2 (1) Lacinia and galea articulated to two different sides of membrana articularis, each entirely free from base to apex (fig. 28). Mandibles

[2] I believe it is peculiar to the Mordellidae that part of the coxa, having almost a semilunar shape, is separated from the coxa itself by a fine suture ; this part is normally inserted under the epipleurae of the elytra. In *Ctenidia* it is quite obvious (fig. 49, *ea*). I suggest the name of " epicoxa " for this particular part of the coxae.

with bladed and fringed mola (fig. 26). Antennae inserted in front of eyes ; 1st segment normal, not scapiform, slightly larger than succeeding segments which are of a variable shape : monoflabellate (starting from the 5th), serrate, moniliform, cylindrical. Eyes always complete, suboval, sometimes bearing a small sinuosity anteriorly near the antennae, but never reniform (fig. 19). Pronotum with lateral margins completely separated from mesothorax, which is extremely short, never surpassing base of elytra ; lateral wings of pronotum only slightly curved downwards, and well separated from prothoracic acetabula. Scutellum free, only partially covered by basal lobe of pronotum in a few genera (fig. 2). Meta-epimera located above meta-episterna, not visible when elytra are closed ; hind coxae enormously developed, sub-semicircular, reaching epipleural margins of elytra ; the part of coxa covered by the epipleura (epicoxa) is of a semilunar shape, and is separated from coxa itself by a very fine but distinct suture. The suture epimero-coxalis entirely covered by elytra. Apophysis of hind coxa feebly sinuate at apex, but never incised at centre (figs. 48, 49) . . . . . **Mordellidae**

3 (4) Antennae of male, starting from 5th segment, flabellate ; segments 5 to 10 bearing at their inner side a single, very long flabellum (fig. 23) ; 11th segment as long as segments 5 to 10 taken together, in form of flabellum. Antennae of females with segments 6 to 10 much prolonged at inner side, but without flabella ; galea in both sexes extremely thin, longer than half of the head (fig. 23, 24–27) **Ctenidiinae** Franciscolo, 1951

4 (3) Antennae of male and female filiform or moniliform, or dentate, but never bearing appendages or flabella at their inner side. Galea in both sexes much shorter than half of the head.

5 (6) Last tergite of abdomen prolonged in form of a long spine (pygidium) of variable length, more or less extended beyond apex of elytra. In a few cases (*Cothurus* Champion, *Phungia* Pic, *Xanthoconalia* Franciscolo) entirely obtected by it. Lateral margin of pronotum bordered to the hind angles near the base ; front margin also bordered . . . . . **Mordellinae** Fowler, 1912

6 (5) Last tergite of abdomen regular, very short, sub-triangular, very seldom with apex extending beyond apex of elytra. Front and lateral margins of pronotum not bordered **Anaspidinae** Ermisch, 1950

In my " 23rd contribution to the knowledge of Mordellidae " (*Atti Soc. ital. Sci. nat.*, **90** : 56) I emphasised the similarity between some of the characters of *Ctenidia* and those of *Pselaphostena* m. and *Stenalia* Muls. The similarity is seen in the peculiar form of the head, which is extremely convex, with a largely arcuated posterior margin, with very large temples ; the elytra are just divaricated at their apex as in the two above-mentioned genera ; the metathoracic episterna are formed exactly as in *Pselaphostena* and *Stenalia*. The resemblance is much more evident in the shape of the genital apparatus ; the penis is, in fact, extremely short, as in these genera ; the parameres have a very pronounced symmetry and, though they are much more sclerotised than in *Pselaphostena* and *Stenalia*, they can be considered very close to those of these two genera in shape and symmetry. However, in *Ctenidia* the form of the aedeagus recalls, mainly in the shape of the inner segments, some of the more developed genera, such as *Glipa* Lec. and *Hoshihananomia* Kôno.

WHAT IS *FORFICULA RODZIANKOI* SEMENOV?

By Malcolm Burr, D.Sc., F.R.E.S.

In 1901 the late A. P. Semenov-Tian-Shanski described an earwig from Harrar, Abyssinia, under the name *Forficula rodziankoi*. The type is stated to be unique. It is a male, large and stoutly built, dark-coloured and brachypterous, with a strong tooth at the end of the laminate part of the forceps. He states that it is nearest to the Russian earwig, *F. tomis* Kolenati, from which it differs mainly in the presence of the tooth on the forceps. No information is given as to the altitude at which the material was collected.

An earwig thought to be *Forficula rodziankoi* has since been recorded from various East African localities by several authors. That is, by Borelli (1915) from localities in Kenya, Kijabe, the Kikuyu Escarpment without further detail, and Wambongo on the Nyeri road in Kikuyu County; by myself (1907–08) from the material collected by the Archduke Adolf zu Mecklenburg's expedition to Central Africa, from Frangi, Ninagongo, Ruwenzori, *ca.* 2500 m., Kasindi, Kissenji and Bugoie. Rehn, in his paper on the George Vanderbilt expedition (1937), records it again from Kenya, from 8200 ft., on the Kikuyu Escarpment, Kijabe section.

In a discussion in his paper on the Swedish Expedition to Central Africa of 1921, Rehn (1925) suggested that his specimens from Kenya are nothing but a montane form of *F. senegalensis* Serville. He does not make his meaning exactly clear whether he regards it as a subspecies or not. But in the meantime it is preferable, in my opinion, to treat the two as distinct species. *F. rodziankoi* is so massive and dark, occurring on the moist uplands, while *F. senegalensis* is small, yellow and widely distributed throughout the Ethiopian Region, where its characteristic biotope is among reeds and rushes and in moist herbage. Rehn concludes that "everything indicates that his (Semenov's) *rodziankoi* is a montane type of localised occurrence over a relatively extensive section of Eastern Africa from Abyssinia southwards at least to Southern Tanganyika (1936), modified in response to unknown environmental conditions." Such modification occurs in other earwigs and is well known in the Orthoptera. In a letter to me my old friend writes that "it is a moorland beast on the fog-swathed Kijabe Escarpment," and he considers it a relict of the Pleistocene fauna.

The situation is complicated by the discovery by Professor Kosswig, under a stone on the shores of Lake Nazik, in eastern Anatolia, of a fine earwig so closely resembling the African ones that on seeing it I exclaimed in surprise, "*Forficula rodziankoi!*"

To my letters to Leningrad asking for a photograph of the type of *F. rodziankoi* no reply has been received. But in the British Museum (Natural History) there is a fine macrolabious male, also from Harrar, labelled by Semenov-Tian-Shanski himself: "A. Semenov det." A photograph of this, for which I am indebted to Mr. Benson, clearly shows the tooth at the end of the laminate part of the forceps (fig. 1). A photograph of *F. sjöstedti* Burr (fig. 3) from

Kilimanjaro shows a similar tooth, but this species is quite distinct, being much more slender and more lightly built, with a tongue-shaped pygidium which is distinctive.

The photograph of the Turkish specimens from Lake Nazik (fig. 4) shows that the lamination of the forceps ends without any tooth, so it is distinct from *F. rodziankoi*. But it is so close to a macrolabious *F. tomis* from the Southern Ukraine (fig. 5) that I feel no hesitation in identifying the Turkish specimens with *F. tomis* Kolenati, of which Mr. Benson has also kindly sent me a photograph.

What then are the East African moorland earwigs recorded by myself, Borelli and Rehn in past years under the name *F. rodziankoi* ?

Rehn states clearly (1936) that his males show no trace of a tooth on the forceps. These agree, therefore, with the specimens from Ruwenzori and other localities recorded by me (1907–08), and with them we can no doubt associate those recorded by Borelli (1915) from the Kikuyu Escarpment.

The problem then is to decide what is the distinction, if any, between the East African forms and the Russo-Turkish *F. tomis*.

Professor Kosswig was kind enough to give me a duplicate of the Nazik earwig to send to Mr. Rehn for comparison with his East African material. He replied that the Turkish specimens are definitely larger than any of the Kenya specimens, none of which have the sutural margin quite as long as the median length of the pronotum, while the distal margin in the Kenya specimens is always obliquely truncate, whereas in the Turkish specimens it is straight. All the Kenya specimens have the shoulder of the elytra much less evident. That is to say that brachelytrism has proceeded further in the African than in the Turkish specimens.

F. tomis is the typical Russian earwig, common enough to be regarded as a nuisance in gardens and kitchen-gardens. It is a robust insect, with strong, broadly laminate forceps in the male. The cyclolabious form (fig. 6) is a more massive looking insect than the elongate macrolabious form (fig. 5). It tends to spread outside Russia, as it has been recorded as imported into western Siberia (Bey-Bienko, 1937). The first specimens recorded outside Russia proper were, so far as I am aware, a pair that I took at Dusheti, on the southern flank of the main range of the Caucasus, in Georgia, in 1915. Its discovery by Professor Kosswig in eastern Anatolia is extremely interesting. Nazik is a small lake situated about fifteen kilometres to the north of Lake Van, on lavas of Pleistocene age, within the arid, volcanic district of Mt. Ararat.

The relationship between *F. tomis* and *F. rodziankoi* is very close, but that between *F. tomis* and the Kikuyu specimens closer still. The only distinctions that have so far been noted are in the greater degree of brachelytrism in the African specimens, the distance apart of their homes, and a slight difference in the male pygidium, which Rehn describes in the African specimens as having a " minute but distinct, elevated ventro-dorsal rib." The photographs of *F. tomis* have a more rounded pygidium with truncate apex. Probably a comparison of actual specimens would reveal other differences of detail in the sculpture, particularly of the last dorsal segment. Possibly there may be a difference in the genitalia.

We can venture, then, I think, to treat them as distinct species and so I describe the African ones as :

Forficula rehni **nom. nov.**

pro *F. rodziankoi* Rehn (1925, 1937), nec Semenov (fig. 2).

A stoutly built, dark coloured, strongly brachelytrous earwig, closely resembling *F. tomis* Kol., but differing in the form of the pygidium, which has a " minute but distinct elevated ventro-dorsal rib." The elytra are strongly reduced, not shouldered, and obliquely truncate posteriorly, so that the dorsal suture is clearly shorter than the lateral margin. The male forceps are strongly laminate for at least half their length, this portion terminating in an obtuse angle, with no trace of a tooth.

East Africa : Kenya, Kikuyu escarpment, Kijabe section, on foggy moorland at 8200 ft. (*Rehn, Borelli*); Nyeri road, in Kikuyu county (*Borelli*); Ruwenzori, foot, west side and 2500 m. Central Africa (? Tanganyika), Kissenji, Bugoie, in forest ; Frangi and Ninagongo (*Burr*).

What degree of differentiation Rehn intends when he uses the expression " montane form " is not quite clear, but the distinction is so clear that, to my mind, the burden of proof rests upon those who consider them a single species, and the montane form certainly requires a distinctive name.

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Semenov-Tian-Shanski, A., 1901, De nova *Forficulae* specie aethiopica. *Rev. russe Ent.* **1** : 48–49.

PLATE I.

Fig. 1.—*F. rodziankoi* Semenov. Harrar. Macrolabious male.
Fig. 2.—*F. rehni* Burr. Kenya. Macrolabious male.
Fig. 3.—*F. sjöstedti* Burr. Kilimanjaro. Macrolabious male.
Fig. 4.—*F. tomis* Kolenati. Turkey. Macrolabious male.
Fig. 5.—Ditto. Ukraine. Macrolabious male.
Fig. 6.—Ditto. Caucasus. Cyclolabious male.

Scale on the left of each specimen is in millimetres.

Forficula rodziankoi Semenov and related species.

M. Burr.

Adlard & Son, Ltd., Dorking.

THE RELIABILITY OF THE E/F RATIO, A MEASURE OF PHASE STATUS, IN FRESH AND IN DRIED LOCUSTS (ORTHOPTERA).

By F. O. Albrecht, F.R.E.S.

(*International Red Locust Control Service, Abercorn, N. Rhodesia.*)

The phases of locusts differ from one another not only in appearance but also in physiology and behaviour, and it is desirable to be able to relate the several differences. Most locust specimens from the field do not become available for estimates of phase status by measurement until after they have been dried; in laboratory analytical experiments, on the other hand, the measurements sometimes have to be made on the living animals. It is therefore necessary to see what relation there is between these measurements when made on dried and on fresh specimens.

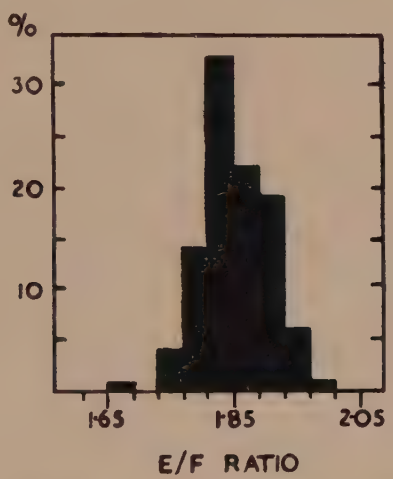

Fig. 1.—Frequency distribution of the ratio E/F (elytron length divided by hind femur length) of the female Red Locusts in the sample investigated, measured in a fresh condition. The distribution is normal enough for the statistical treatment used.

An opportunity of doing this occurred in 1950, when adults of the Red Locust, *Nomadacris septemfasciata* (Serville), were collected in the Rukwa Valley of S. W. Tanganyika, and measured alive or immediately after death. When they were measured again later, after drying, differences were found, and this paper reports an examination of those differences.

Material and Methods.

The locusts used in the main analysis were a single sample caught near Nackachese on 30.x.50. Their measurements were substantially those of phase *solitaria* (Callaway, 1948; Burnett, 1951). Fig. 1 shows that the distribution of ratios of elytron length (E) to femur length (F) is normal enough for the purpose of this investigation.

The measurements were made in the way prescribed by the Fourth International Locust Conference, Cairo, 1936 (Egypt, 1937), but the ratios were worked out before calculating the averages, so as to allow estimations of error.

The calipers used for measuring could be read, by means of a vernier scale, to 0·1 mm. and the same instrument was used throughout. All the measurements were made by a single person, an African field assistant named Andrew Manoni ; he was not told of the object of the work, and he made each measurement a second time without knowing the previous result. For these reasons it is hoped that personal error and bias are small.

Four complete sets of measurements were made of the same specimens (1) immediately after catching and killing, (2) sun-dried for a first time, (3) relaxed between layers of damp cotton wool and (4) sun-dried for a second time.

Inspection of Table I shows that in no case did the difference between two averages for the same material exceed its standard error. That is to say, for samples of 100 specimens, it does not matter whether they are measured fresh or dry ; the average for females was 1·85 ± 0·005 and for males 1·86 ± 0·005.

TABLE I.—*Results : Average E/F Ratios and Standard Errors of the Means.*

Condition of locusts.	Females.	Males.
Fresh	1·8472 ± 0·0052	1·8610 ± 0·0046
Sun-dried . . .	1·8504 ± 0·0052	1·8643 ± 0·0046
Relaxed . . .	1·8467 ± 0·0052	1·8603 ± 0·0047
Re-dried . . .	1·8482 ± 0·0053	1·8584 ± 0·0046

At the same time it was evident that shrinkage did occur on drying. Thus, in a previous sample, the elytra measured roughly 64 mm. and 54 mm. for females and males respectively ; at the first drying the measurement diminished significantly by an average of 0·19 mm. ± 0·035 in both sexes. The shrinkage of the femur was rather less, but it was considerably more variable and did not differ significantly from zero. The result was a slight but not significant rise in the E/F ratio. It seems likely, however, that shrinkage did occur in the femora, so in order to avoid a systematic error, slight though it may be, it is advisable to measure both the elytron and the femur in the same condition, i.e., either both fresh, or both dried to a steady condition.

The reason for the failure to demonstrate a significant shrinkage in the femur is not far to seek. The average shrinkage found was of the order of 0·05 to 0·10 mm. in the previous sample and about 0·36 per cent. in the main Nackachese sample. The limit of reading on the calipers is 0·1 mm., so that errors of reading of 0·05 mm. will occur frequently and a more refined instrument would be required to estimate the shrinkage reliably. It is worth noticing that if a locust has a wing length (E) of 60·0 mm. and a femur length of 32·3 mm., and if the two measurements are made with errors of 0·05 mm., in opposite directions, the ratio would change from 1·858 to 1·862, or by 0·004. That is to say, instrumental limitations exclude any importance at all being attached to the third figure beyond the decimal point for a single specimen. With a substantial number of specimens, this error should not be systematic and should not much affect the mean. In Table I it will be seen that the standard errors of the means of 100 specimens are also about 0·005. Clearly there would normally be little purpose in expressing the mean for females any more exactly than as 1·85, and

for males as 1·86. The lowest value for females (1·8467 ± 0·0052) and the highest for males (1·8643 ± 0·0046) differ by 0·0176 ± 0·0069, a difference which is significant ($p = 0·012$). This is to say, further decimal points are required when testing for significance of differences.

Summary.

Tests have been made on *Nomadacris septemfasciata* (Serville) to discover whether estimates of phase status of locust populations based on E/F ratios are affected when the measurements are made on fresh specimens instead of on dry specimens. There is a tendency for the mean ratio to be higher in dried specimens, but it is very slight and is not significant with 100 specimens.

Acknowledgments.

I am grateful to Dr. D. L. Gunn for his advice and criticism throughout the course of this investigation, and to Dr. H. O. Backlund for his help and encouragement.

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Book Notice.

British Pyralid and Plume Moths. By Bryan P. Beirne. 8vo. London (Frederick Warne & Co. Ltd.), 1952. Pp. 208, 16 pls. (col.), text illust. Price 21*s*.

This new book in the Wayside and Woodland Series summarises the present knowledge of the Pyralid and Plume moths in the British Isles. The keys and the abundant illustrations are intended to enable every species found in the British Isles to be identified as far as possible without dissection or damage. As the key characters and profuse illustrations are sufficient for identification, actual descriptions of the moths are not included. The descriptive matter given for each species comprises a summary of the available information on variation, distribution, habits and life history and a brief description of the larva. An indication is given of aspects of their biology which require further investigation. Coloured photographs are given of all species except a few rare vagrants.

An Appendix comprising a list of works on British Pyralidae and Pterophoridae, a Glossary and an Index complete the work.

ON SOME COCCOIDEA COLLECTED BY MR. J. R. WILLIAMS IN RÉUNION ISLAND. (HEMIPTERA.)

By Raymond Mamet.

(*Department of Agriculture, Mauritius.*)

The Coccoid fauna of Réunion Island[1] is very poorly known and only 16 species have so far been recorded (1914, Bordage, *Bull. sci. Fr. Belg.* **47** : 377–412 ; 1943, Mamet, *Bull. Mauritius Inst.* **2** : 137–170 ; 1952, Mamet, *loc. cit., in press*).

Mr. J. R. Williams, Entomologist of the Department of Agriculture, Mauritius, has very kindly made available to me for study a small collection of Coccoids which he brought back from Réunion Island, where he spent a few weeks on an official mission. This collection, in which no new species is represented, is nevertheless very interesting, since it helps to increase the knowledge of the geographical distribution of certain species.

I wish to tender my thanks to Mr. Williams for his kindness in submitting to me this collection, which was in excellent condition.

Margarodidae.

Icerya seychellarum (Westwood).—On leaflets of *Livistona chinensis*, St. Denis, 19.vii.1951, No. RHe 37.

Dactylopiidae.

Dactylopius tomentosus (Lamarck).—On *Opuntia tuna*, La Bretagne, 8.viii. 1951, No. RHe 76.

These specimens were accompanied by the following note : " Stated by Mr. D. d'Emmerez de Charmoy to have been introduced by him about 1929 from Mauritius."

Pseudococcidae.

Pseudococcus boninsis (Kuwana).—On sugar-cane stems, La Bretagne, 18.viii.1951, No. RHe 21 ; on sugar-cane, St. André, 6.viii.1951, No. RHe 75.

Pseudococcus longispinus (Targioni-Tozzetti).—Remains of one female of this species could be detected on a leaflet of *Oreodoxa regia*, St. Denis, 19.vii.1951, No. RHe 29.

Trionymus sacchari (Cockerell).—On sugar-cane stems, La Bretagne, 18.vii.1951, No. RHe 21 ; on sugar-cane stems, Bois Rouge, 22.vii.1951, No. RHe 64.

Aclerdidae.

Aclerda thysanolaenae Mamet.—On sugar-cane stem, La Bretagne, 28.vii. 1951, No. RHe 69. Four females and numerous first stage larvae examined.

This species seems to be very closely related to *A. takahashii* Kuwana as redescribed by Ferris (1950, *Microentomology*, **15** : 9–10, figs. 11 and 12).

[1] Réunion Island lies between 20° 51′ and 22° 22′ South and 55° 15′ and 55° 54′ East at about 130 miles to the South-West of Mauritius. It has an area of 970 sq. miles.

Coccidae.

Coccus hesperidum Linnaeus.—On *Bauhinia* sp., St. Denis, 19.vii.1951, No. RHe 25 ; on undetermined plant, St. Denis, 19.vii.1951, No. RHe 33.

Euycalmnatus tessellatus (Signoret).—On *Chrysalidocarpus lutescens*, St. Denis, 19.vii.1951, No. RHe 26, with *Hemiberlesia cyanophylli* (Sign.) and *Phenacaspis dilatata* (Green).

Diaspididae.

Aspidiotus destructor Signoret.—On coconut leaves, near Bois Rouge, 19.vii. 1951, No. RHe 41 ; on coconut leaves, St. Denis, 21.vii.1951, No. RHe 58, with the Aleyrodid, *Stenaleyrodes vinsoni* Takahashi.

Aulacaspis tegalensis (Zehntner).—On sugar-cane stems, La Bretagne, 18 and 26.vii.1951, Nos. RHe 15 and 67 ; on sugar-cane leaf sheath, La Bretagne, 18.vii.1951, No. RHe 19.

Some specimens in collection No. RHe 15 were parasitised by a Chalcid.

Chrysomphalus ficus (Ashmead).—On *Cycas madagascariensis*, St. Denis, 19.vii.1951, No. RHe 23 ; on *Chrysalidocarpus lutescens*, St. Denis, 19.vii.1951, No. RHe 26 ; on *Dypsis madagascariensis*, St. Denis, 21.vii.1951, No. RHe 51.

A leaf-infesting species. The above specimens were heavily parasitised by a Chalcid.

Chrysomphalus dictyospermi (Morgan).—On *Agave rigida*, St. Denis, 21.vii. 1951, No. RHe 42.

Coccomytilus greeni (de Charmoy).—On " Vacoas " leaves (*Pandanus* sp.), St. Joseph, 31.vii.1951, No. RHe 72.

It is interesting to note that this species, which was originally described from Mauritius (1899, *Publ. Soc. amic. Sci. Mauritius*, **1899** : 33), also occurs in the neighbouring Réunion Island.

This species is not typical of the genus *Coccomytilus* and a new genus will have to be erected to receive it.

Diaspis echinocacti (Bouché).—On an undetermined ornamental Cactaceae, St. Denis, 10.viii.1951, No. RHe 78.

Only one specimen received.

Hemiberlesia cyanophylli (Signoret).—On *Chrysalidocarpus lutescens*, St. Denis, 12.viii.1951, No. RHe 26 ; on banana leaves, St. Denis, 21.viii.1951, No. RHe 45 ; on coconut leaves, La Bretagne, 28.vii.1951, No. RHe 70.

Hemiberlesia rapax (Comstock).—On stem of " Branle," Plaine des Palmistes, 14.vii.1951, No. RHe 2.

Hemiberlesia lataniae (Signoret).—On *Bauhinia* sp., St. Denis, 19.vii.1951, No. RHe 25.

Ischnaspis longirostris (Signoret).—On *Chrysalidocarpus lutescens*, St. Denis, 19.vii.1951, No. RHe 26.

Lepidosaphes tokionis (Kuwana).—On leaves of *Codiaeum* sp., St. Denis, 21.vii.1951, Nos. RHe 48, 50 and 57.

Lindingaspis rossi (Maskell).—On needles of *Araucaria cunninghami*, St. Denis, 21.vii.1951, No. RHe 60.

Phenacaspis dilatata (Green).—On *Chrysalidocarpus lutescens*, St. Denis 19.vii.1951, No. RHe 26.

Pseudaonidia trilobitiformis Green.—This leaf-infesting species was collected at St. Denis on 19 and 21.vii.1951 on the following host-plants : *Ptero-*

carpus ? indicus, No. RHe 22 ; *Citrus* sp., Nos. RHe 24 and 32 ; *Terminalia catappa*, No. RHe 27 ; *Pentaptera arjuna*, No. RHe 28 ; *Oreodoxa regia*, No. RHe 29 ; *Acalypha* sp., No. RHe 30 ; *Dalbergia sissoo*, No. RHe 31 ; undetermined plants, Nos. RHe 33, 35, 38 and 53 ; undetermined climbing plant, No. RHe 34 ; *Cassia siamea*, No. RHe 36 ; *Manihot glaziovii*, No. RHe 43 ; banana, No. RHe 45 ; *Guazuma ulmifolia*, No. RHe 46 ; *Sapindus* sp., No. RHe 47 ; *Canna indica*, No. RHe 49 ; *Callophyllum inophyllum*, No. RHe 52 ; *Peltophorum ferrugineum*, No. RHe 54 ; *Murraya exotica*, No. RHe 55 ; *Punica granatum*, No. RHe 56 ; *Tectona grandis*, No. RHe 61 ; *Laea sambucina*, No. RHe 62.

The specimens on *Guazuma ulmifolia* were parasitised to some extent by a Chalcid.

Pseudaulacaspis pentagona (Targioni-Tozzetti).—On *Geranium* stems, near Tampon, 31.vii.1951, No. RHe 71.

Selenaspidus articulatus (Morgan).—On *Acalypha* sp., St. Denis, 19.vii.1951, No. RHe 30 ; on *Aberia caffra*, St. Denis, 21.vii.1951, No. RHe 44.

Of the above species, the following are apparently recorded for the first time :

Dactylopius tomentosus (Lamarck).
Pseudococcus boninsis (Kuwana).
Trionymus sacchari (Cockerell).
Aclerda thysanolaenae Mamet.
Coccus hesperidum Linnaeus.
Eucalymnatus tessellatus (Signoret).
Chrysomphalus ficus (Ashmead).
Chrysomphalus dictyospermi (Morgan).
Coccomytilus greeni (de Charmoy).
Diaspis echinocacti (Bouché).
Hemiberlesia cyanophylli (Signoret).
Hemiberlesia rapax (Comstock).
Hemiberlesia lataniae (Signoret).
Ischnaspis longirostris (Signoret).
Lepidosaphes tokionis (Kuwana).
Lindingaspis rossi (Maskell).
Phenacaspis dilatata (Green).
Pseudaonidia trilobitiformis Green.
Pseudaulacaspis pentagona (Targioni-Tozzetti).
Selenaspidus articulatus (Morgan).

Book Notice.

Longicornia. Études et notes sur les longicornes. Publiées sous la direction de P. Lepesme. Volume 2. *Longicorn beetles of China.* By J. Linsley Gressitt. Large 8vo. Paris (Lechevalier), 1951. Pp. 667, 22 pls. Price £5 5s. 0d.

This work, which comprises a monograph of the Longicorn beetles of China, is an attempt to bring together the available information on this group in a condensed form and to provide keys for the identification of species.

China, extending from the Palearctic to the Oriental regions, presents a rich combination of basically different faunas and this volume shows that 1895 species have so far been listed and keyed.

In the body of the text the original references are cited under genera and species, and there is a brief general bibliography of literature principally concerned with China or containing relevant information.

An index of genera and species and 22 line plates complete the work.

A NEW SPECIES OF *CULICOIDES* (DIPTERA: CERATOPOGONIDAE) FROM UGANDA.

By Botha de Meillon.

(*South African Institute for Medical Research, Johannesburg.*)

Culicoides bwambanus sp. n. (fig. 1*a*, *b*).

A small brown midge, without any distinctive ornamentation. The wing almost exactly as in *clarkei* Carter, Ingram and Macfie, but the male terminalia distinct. The antennae are unfortunately missing so no measurements can be given.

Female.—Head: Eyes bare, separated. *Thorax:* unspotted, brownish with paler areas which cannot be accurately defined because of the shrunken condition of the specimens. Scutellum with a pair of admedian bristles and one lateral bristle on each side. *Wing:* Length 1·16 mm.; well supplied with macrotrichia and with pale spots as in *clarkei*; an additional pale spot just above the fork of the cubital vein may serve to distinguish it

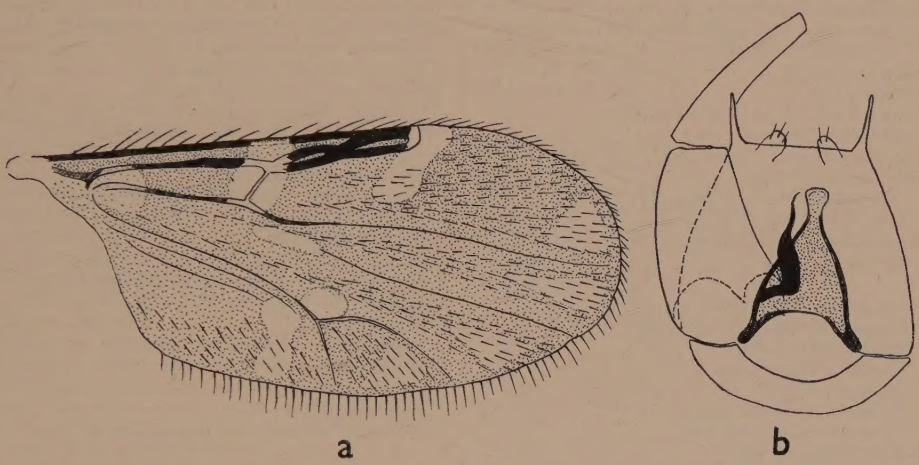

Fig. 1.—*Culicoides bwambanus* sp. n., *a*, female wing; *b*, male terminalia in ventral view.

from that species. *Abdomen:* Brown with three spermathecae, two subequal, large, pyriform, measuring 48 μ × 40 μ, only the very commencement of the duct pigmented, the third spermatheca minute, elongate, 20 μ long.

Male.—As in the female but macrotrichia, as usual, scantier on the wing. *Terminalia:* Ninth tergite broad, apical margin straight, apical lateral processes very long and thin; aedeagus scoop-shaped, the apex slightly expanded and bent ventrally, the ventral wall pigmented and well differentiated from the membrane joining it to the ninth sternite, the membrane devoid of spines; paramere broad basally, and just beyond the middle rather suddenly narrowed to a sharp, short termination.

The scoop-like aedeagus with its well pigmented ventral wall and the paramere without a long thread-like termination immediately separate this species from *clarkei*.

Holotype, ♂, Uganda: Bwamba, 1948, caught in a suction trap 60 ft. up in a tree (*W. R. Lumsden*), in the British Museum (Nat. Hist.) Paratypes, 1 ♂, 2 ♀, bearing the same labels as holotype, in the South African Institute for Medical Research, Johannesburg.

I am indebted to Mr. Paul Freeman of the British Museum for comparing the species with *clarkei*, of which I have no specimens.

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Errata.

Paper by *R. L. Usinger*

Page 145, *insert* between lines 32 and 33 the second half of couplet 11, as follows:

—. Anterior femora unarmed. Connexivum immaculate. China . . . . . **Sinorsillus** Usinger, 1938

Page 145, line 33. *For* "—." *read* "12."